THE IRON TRADE REVIEW

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SHEETS AND TIN PLATE

WILL BE MADE ON EXTENSIVE SCALE AT GARY,

Where Corporation Will Build Two Fifty-Mill Plants — Harvester and Radiator Interests Buy Round Tonnages of Pig Iron.

Important developments show the increasing importance of the Chicago territory as a manufacturing center. The United States Steel Corporation has decided to build a 50-mill tin plate plant and a 50-mill sheet plant at Gary. These plants will be the largest of their kind in the world, and their erection may have considerable bearing on the maintenance of the open shop principle for which the Corporation is now fighting in its sheet and tin plate mills. The announcement of an advance of $1 per ton in prices of bars, plates and shapes by the Carnegie Steel Co. has not been followed by the Illinois Steel Co., which continues to quote former Pittsburg prices plus the freight rate. This is an important step toward abandoning the time honored custom of making Pittsburg the basing point for these products, and will enable Chicago plants to deliver their products at lower prices than formerly. As the building of the Gary plant proceeds, it is the Corporation's policy to take care of its western business at its western mills. An independent interest, the Inland Steel Co., which is about to double the capacity of its sheet plant, has advanced its prices in harmony with the action of the Carnegie Steel Co. It is practically sold up, however, for the remainder of the year.

Railroad Buying Orders from railroads during the past few days have amounted to 20,000 tons of rails. Inquiries for large tonnages of rails are pending, and the demand for track equipment shows much improvement. The Edgar Thomson mills of the Carnegie Steel Co. rolled a greater tonnage of rails during the first half of the present year than during the entire 12 months of 1908.

Pipe Line Contracts There is increasing delay in the delivery of nearly all finished products, and from five to seven weeks are often necessary. The National Tube Co. has taken an order for 125 miles of 16-inch pipe for a gas line in Texas. The Barnsdall interests bought 21 miles of 8-inch pipe for a gas line at Oklahoma, and the Philadelphia Co. has placed orders with different companies for about 30 miles of 4 and 6-inch iron line and casing, and 11 miles of 20-inch steel pipe.

Steel and Tin Plate The strike of the Amalgamated Association against the American Sheet & Tin Plate Co. will probably have little effect on the sheet production of the company, as only one sheet plant has been rendered idle. The production of tin plate has been sharply reduced, but the company has a large stock on hand and believes that it will be fully able to take care of its customers. It has started several of its non-union plants to offset the idle union capacity. The tin plate business is usually dull in July and August.

Structural Material The total contracts for structural material for the first half of the year are estimated at 650,000 tons, which is nearly one-half the annual capacity. A very large percentage of this contracting has been done during the past three months. The contract for the new bridge across the Ohio, at Sewickley, Pa., 5,000 tons, has been awarded to the Fort Pitt Bridge Works, and the McClintic-Marshall Construction Co. has awarded the contract for 6,000 tons of structural shapes for the Denison-Harvard bridge at Cleveland to the Carnegie Steel Co. Some very important building projects are pending in New York City.

Pig Iron Conditions Pig iron production for the first half of the present year, not including charcoal iron, amounted to 10,820,059 tons, an increase of 59 per cent over the first half of 1908, and a decrease of 18 per cent compared with the first half of 1907. The average daily production for June was 64,331 tons, compared with 60,218 tons in May. Heavy buying of pig iron by the leading harvester and radiator interests has been a leading feature of the market during the past week. The International Harvester Co. purchased a large tonnage of both northern and southern irons for various plants and the American Radiator Co. has purchased about 25,000 tons for its plants at Detroit, Buffalo and Titusville. Buying by these concerns is usually followed by the placing of many orders by other companies. Cast iron pipe interests in the east have purchased about 25,000 tons, and throughout the country there is moderate buying of malleable and foundry grades. The pig iron output of the Steel Corporation for July promises to be the largest of any month in its history. Its stocks of pig iron are now very low.

All of the 12 open-hearth furnaces of the Colorado Fuel & Iron Co.'s plant at Pueblo, Colo., are in operation and business is reported unusually good for this season of the year.

THE WEEK IN IRON CENTERS

PITTSBURG.

Iron Industry Continues to Show Strength During Dull Season.

Office of THE IRON TRADE REVIEW,
510 Park Building, July 6.

With the mid-year period at hand when iron and steel plant activities are normally at their lowest point by reason of inventory taking and repair making, the general industry continues to manifest a growing strength in all its various lines of production. Specifications show no perceptible falling off and in some products increased tonnage is being entered for rolling. The indications of a sustained activity of the mills over the summer months are more promising.

Of importance as illustrating the stronger confidence in the future ruling among makers, is the action of steel bar manufacturers in the week of making further price advances. The leading interest is now quoting a minimum of 1.25c Pittsburg on bars and with the large independents is asking 1.35c Pittsburg on plates and shapes. Some independent steel bar makers have kept in advance of this action by raising their previous quotations of 1.25c Pittsburg to 1.30c Pittsburg. Steel bar tonnage is moving freely into consumers' hands, the contracts for the first half having been very fully specified.

Considerable buying of large-sized pipe for oil and gas line purposes has been done in the past month and it is estimated that easily a total of 500 miles has been closed in that period. Important transactions have been made for California and Texas fields and others are pending. Some mills, particularly mong the independents, are filled up for several months ahead and are declining to commit themselves on deliveries to the projectors of several large lines which are still in the market. Iron pipe makers have advanced their prices, but official quotations on steel pipe remain the same as established shortly after the open market was declared in February.

The strike of the Amalgamated Association of Iron, Steel and Tin Workers against the American Sheet & Tin Plate Co. is having little effect upon the sheet situation, as only one important mill has been forced to close. Tin plate production has been cut down from 83 to 40 per cent of total capacity although two non-union plants were started the past week. The normally quiet season in tin plate now at hand, together with a large stock of finished product accumulated by the company over the past six months, is being held out as an assurance to consumers that their needs will be filled.

Pig Iron.—Consumers are not giving the pig iron market much attention at this time, the mid-year inventory activities and the idle condition of many plants contributing to this state of trade. Sales made, however, indicate a strength in prices at the quoted level.

Steel companies which have been recent buyers of Bessemer iron are not expected to enter the market again very soon. The purchases made, it is believed, will fill out their needs very well and some of these interests whose plants are now shut down are running their blast furnaces and are accumulating iron against their later requirements. Some buying of prompt Bessemer has been done at $15.25 valley, but on forward deliveries, makers are generally asking $15.50 valley. The average price of Bessemer iron for the month of June was $15.23 valley or $16.13 Pittsburg and the sales upon which this was computed were the heaviest in two years. The Bessemer average for May was $14.58 valley or $15.48 Pittsburg.

The basic average for June was $14.94 valley or $15.84 Pittsburg compared with $14.12 valley or $15.02 Pittsburg in May. A few furnaces are still quoting $15 valley for No. 2 foundry, but the usual price asked is from $15.25 to $15.50 valley. A sale of 500 tons of No. 1 foundry for last half shipment was made the past week at $15.50 valley. Malleable shows little demand.

Southern makers who have recently advanced their prices to a basis of $12.50 Birmingham for No. 2 report some tonnage having been closed at this figure for fourth quarter delivery.

On prompt and third quarter delivery on northern iron, we quote as follows:

Bessemer, valley	$15.25 to 15.50
Bessemer, Pittsburg	16.15 to 16.40
No. 2 foundry, Pittsburg	15.90 to 16.40
Gray forge, Pittsburg	14.90 to 15.15
Basic, valley	15.00 to 15.25
Basic, Pittsburg	15.90 to 16.15

Ferro-Alloys.—The Jones & Laughlin Steel Co. has recently been a heavy buyer of ferro-manganese and is understood to have contracted for approximately 10,000 tons for delivery up to July 1, 1910, at from $43 to $44 delivered, figured upon the present duty. Another large local steel interest has closed for 1,500 tons for delivery up to July 1, 1910, at about $41.75 Baltimore or $43.70 delivered, at the present duty. The market on 50 per cent ferro-silicon at the present duty is about $61.50 to $62.50 delivered. On forward deliveries where the duty is made to the account of seller, $67 Pittsburg is asked. We quote ferro-manganese at from $41.50 to $42.50 Baltimore at present duty for prompt or forward delivery with a freight rate of $1.95 to Pittsburg.

Fifty per cent ferro-silicon is quoted at $61.50 to $62.50 Pittsburg on forward deliveries, at present duty; domestic, 12 per cent, $25; 11 per cent, $24; 10 per cent, $23 Pittsburg.

Plates. — The plate market has strengthened considerably and the 1.35c Pittsburg price is now general among such principal makers as the Carnegie Steel Co., Jones & Laughlin Steel Co., Lackawanna Steel Co. and La Belle Iron Works, the first named company having been the last to fix its quotations at this level. The smaller mills which usually shade prices are well filled up and concessions are very infrequent. Some cancellation of unspecified plate tonnage on contracts expiring July 1 has been made, the mills assuming the position that orders received indicate the value of a contract. Considerable steel car business continues to be figured upon and the inquiry of the Baltimore & Ohio railroad is receiving serious attention. This road has increased its original inquiry and is now figuring on between 5,000 and 6,000 cars. Bids for the construction of the first class battleships Arkansas and Wyoming will be opened by the government Aug. 18. Each of these vessels will require 12,000 tons of steel consisting principally of armor plate and armament. Some tank tonnage is still in the market. We quote the present market as follows:

Tank plates, ¼-inch thick, 6¼ to 100 inches, 1.30c to 1.35c mill. Extras are as follows per 100 pounds: Boiler and flange steel plate, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches, 0.05c;

over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ¼-inch to and including 3/16-inch plate on thin edges, 0.10c; under 3/16 to and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Sheets.—The strike of the Amalgamated Association of Iron, Steel and Tin Workers now in progress against the American Sheet & Tin Plate Co. promises to have little effect upon the sheet production of the company. Only five of the plants are unionized and of these Midland and Struthers have not been in operation. The only plant of importance rendered idle by the strike is the Aetna-Standard at Bridgeport, O., with 23 mills, as the Guernsey plant at Cambridge, O., with 11 mills did not obey the strike order of the union. The only other union sheet mill of the leading interest is the small Piqua, O., plant of four mills. The company has a number of idle non-union sheet plants which it can place in operation if needed. The signing of the new scale of the Amalgamated by the independents insures these operations against any interruption, and sheet consumers generally are not likely to suffer from the present strike. Current bookings in sheets are good and deliveries by some independent interests are backward. Prices have hardened considerably, but some shading is still being done. We quote present prices, which are subject to some shading, as follows:

Blue annealed sheets, Nos. 10 and heavier, 1.60c; Nos. 11 and 12, 1.65c; Nos. 13 and 14, 1.70c; Nos. 15 and 16, 1.80c; box annealed sheets, Nos. 10 to 12, 1.85c; Nos. 13 and 14, 1.90c; Nos. 15 and 16, 1.95c; Nos. 17 to 21, 2c; Nos. 22 to 24, 2.05c; Nos. 25 and 26, 2.10c; No. 27, 2.15c; No. 28, 2.20c; No. 29, 2.25c; No. 30, 2.35c; galvanized sheets, Nos. 13 and 14, 2.25c; Nos. 15 and 16, 2.40c; Nos. 17 to 21, 2.50c; Nos. 22 to 24, 2.65c; Nos. 25 and 26 2.85c; No. 27, 3.05c; No. 28, 3.25c; No. 29, 3.40c; No. 30, 3.65e; painted roofing sheets, $1.55 per square for No. 28 gage, 2½-inch corrugation, and galvanized roofing sheets, $2.80 per square for No. 28 gage, 2½-inch corrugation.

Tin Plate.—The American Sheet & Tin Plate Co. at the present time has active about 40 per cent of its tin mill capacity, the strike of the Amalgamated having temporarily closed all the nine union plants with the exception of the American at Elwood, Ind., which is running at partial activity. During the past week the company started its non-union Demmler plant of 11 mills and its non-union Monongahela plant of nine mills, to offset the idle union capacity. The season's movement in tin plate is normally lightest in July and August and as the company has also piled considerable stock, it is assuring customers that their needs will be well guarded. Specifications in June were very heavy and July is expected to show light orders. The Standard Tin Plate Co., Canonsburg, Pa., July 6 started its four new additional tin plate mills, recently installed, and is now operating a plant of 10 mills. Tin plate prices are regular and we quote the present market as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.45 f. o. b. mill Pittsburg district and $3.40 in large lots. Terms 30 days less 2 per cent for cash in 10 days.

Rails and Track Material.—Rail prospects and activities are on the increase as is shown by the fact that the Edgar Thomson mills of the Carnegie Steel Co. rolled a greater tonnage during the first half of the present year than during the entire 12 months of 1908. Different lines are showing more interest in the market than they have for some time. The Carnegie Steel Co. last week booked 5,000 tons of standards, of which 1,500 were ordered by the Flint & Pere Marquette railroad. About 2,000 tons of light rails were also entered. We quote the market on Bessemer rails as follows, the price on open-hearth rails being $30 mill:

Fifty-pound and heavier, 500-ton and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; light rails in lots up to 250 tons, 8-pound, $29; 12-pound, $28; 16 to 25-pound, $27; 30 to 35-pound, $26.75; 40 to 45-pound, $26; on lots over 250 tons, prices are 60c less, and over 500 tons, $1 less; angle splice bars for standard sections, 1.50c Pittsburg; standard spikes, 1.60c to 1.70c Pittsburg; hand spikes, 1.60c to 1.70c Pittsburg.

Steel.—A strong tone characterizes the semi-finished steel market, as makres continue to ask higher prices and as concessions in either billets or sheet bars have disappeared. Open-hearth billets are commanding premiums over the $23 Pittsburg nominal price and some important interests are not quoting under $27 Pittsburg on forging billets. Bessemer billets are stronger in sympthy with open-hearth. Sheet bars are holding firm at $25 Pittsburg. The complete bookings of the rail and billet department of the Carnegie Steel Co. for June agregated 250,000 tons, which was largely made up of semi-finished steel specifications. The June total is an increase of 41,000 tons over May, which had shown the highest tonnage since the depression.

Bessemer 4 x 4 billets with 0.25 carbon and less are regularly quoted at $23 Pittsburg, with the usual extras for size and analysis, and open-hearth rolling billets from $23 to $25 Pittsburg. Forging billets range from $25 to $27 Pittsburg. The regular quotation on sheet and tin bars is $25 Pittsburg. Steel makers divide with consumers the freight within the $1 limit, making the price in such territory $23.50 to $25.50 delivered on billets, and $25.50 delivered on sheet bars.

Hoops and Bands.—New business being entered in hoops is not heavy owing to the off-season in this market now being at hand. There is fair specifying contracts. The attractiveness of specifications is affecting prices, but the latter appear more uniform. We quote the present market as follows:

Hoops in carload lots, 1.50c; in less than carload lots, 1.60c; bands, 1.20c, base half extras as per standard steel.

Merchant Bars.—All the principal makers of steel bars have advanced their prices and the absolute minimum of the market is now 1.25c at which only especially desirable bsuiness will be taken. The Repbulic Iron & Steel Co. and the Cambria Steel Co. during the week raised their quotations from 1.25c to 1.30c along with the action of the Carnegie Steel Co. in fixing upon a 1.25c minimum. Steel bar specifications continue very heavy and there is no sign of any summer let-up in ordering. Contracts expiring July 1 have been well taken out and cancelations of unspecified tonnage have not been heavy. The bar iron markt has been showing some improvement. The Republic Iron & Steel Co., the plants of which are now shut down, next week will start its steel works and continuous bar mills at its Brown-Bonnell and Moline plants. The other mills will remain idle pending the adjustment of the labor scale with the Amalgamated Association. We quote the present market as follows:

Common iron bars, 1.40c to 1.45c, Pittsburg; Bessemer and open-hearth steel bars, 1.25c to 1.30c; plow and cultivator, 1.25c to 1.30c; channels, angles, zees, tees, under 3-inch, 1.35c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size, 0.30c advance. Cold rolled and ground shafting, 60 per cent

in carloads, and 55 per cent in less than carloads, delivered in base territory. Planished and machine straightened tire is 1.40c base; iron finished tire under 1½ by 1½ inches, 1.35c, both plus ½ extra on tire card; iron finished tire, 1½ x ½ and over, 1.20c, plus ½ extra on the steel bar card.

On cold rolled strip steel, width 1½ inches and wider, and 0.100 inch and thicker, we quote base prices for 100 pounds, $3.05 on hard, and $3.30 on soft.

Structural Material.—The structural bookings of the leading interest over the first half of the year have been practically normal and have averaged about 2,000 tons daily. Total orders entered in June were 45,000 tons. The season of the year is having some effect upon the structural situation and new offerings are only fair. Normally, by mid-year, the railroads have placed most of their contracts, so that no important buying by them is anticipated within the next six months. Prices continue unsatisfactory from the fabricator's and erector's standpoint, and bids continue to be made at cost. The Fort Pitt Bridge Works has been awarded the practically 5,000 tons required for the new bridge over the Ohio river at Sewickley, Pa. The company's bid was $372,400 against that of $385,000 by the American Bridge Co., the next lowest. The bridge will have a main span of 750 feet and two end spans of 300 feet each. All the principal makers of structural shapes are now quoting 1.35c Pittsburg. We quote the present market on structural shapes as follows:

Beams and channels, 15-inch and under, 1.35c; over 15 inches, 1.45c; zees, 1.35c; tees, 1.35c; angles, from 3 to 6 inches, 1.35c; over 6 inches, 1.45c; universal and sheared plates, 6¼ inches wide and wider, 1.30c to 1.35c.

Merchant Pipe.—The National Tube Co. has taken an order for 125 miles of 16-inch pipe for a gas line for the Lone Star Gas Co. of Texas. The line will extend from Petrolia, Texas, to Fort Worth and Dallas. In addition to the 180 miles of 8-inch rifled pipe awarded and announced some time ago, interests connected with the Union Pacific railroad have placed 200 miles of the same size with two independent mills for California delivery. The Barnsdall interests have bought 21 miles of 8-inch pipe for a gas line in Oklahoma and the Philadelphia Co. has placed orders with different mills for about 30 miles of 4 and 6-inch iron line and casing and 11 miles of 20-inch steel pipe. All the mills making large-sized pipe have important contracts upon their books and some of them are sold up for several months on this class of material. There are several large line contracts still to be placed, but some trouble may be caused for the projectors by their inability to obtain desired deliveries. Makers of iron casing are advancing their prices from $1 to $2 a ton and one important iron pipe producer has increased its quotations $4 a ton. Steel pipe is unchanged. Quotations on merchant pipe are regular. We quote the following official discounts on merchant pipe subject to an additional one point and five off to jobbers:

	—Steel—		—Iron—	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch.....	72	56	69	..
⅜ inch	73	59	70	56
½ inch	76	64	73	61
¾ to 6 inch.....	80	70	77	67
7 to 12 inch.....	75	60	72	57
PLUGGED AND REAMED.				
1 to 4 inch.....	78	68	75	65
EXTRA STRONG PLAIN ENDS.				
⅛ to ⅜ inch.....	65	53	62	50
½ to 4 inch.....	72	60	59	57
4½ to 8 inch.....	68	56	65	53
DOUBLE EXTRA STRONG PLAIN ENDS.				
½ to 8 inch.....	61	50	58	47

Boiler Tubes.—Little improvement is appearing in boiler tubes. The merchant trade is quiet and the demand from locomotive construction is still moderate. The market is subject to its usual irregularities. We quote the following official discounts on lap-welded steel boiler tubes to jobbers in carloads:

1 to 1½ inch.....	50
1¾ to 2¼ inch.....	62
2½ inch	64
2¾ to 5 inch.....	70
6 to 13 inch	62

2½ inch and smaller, over 18 feet, 10 per cent net extra.
2¾ inch and larger, over 22 feet, 10 per cent net extra.
To destinations east of the Mississippi river will be sold at delivered discount for carloads lowered by two points, for lengths 22 feet and under; longer lenghts, f. o. b. Pittsburg.

We quote the following official discounts on charcoal iron tubes to jobbers:

1 to 1½ inch.....	45
1¾ to 2¼ inch.....	45
2½ inch	50
2¾ to 5 inch	57
6 to 13 inch.....	45

Wire Products.—A fair amount of new buying by those consumers who did not cover for their needs at the $1.60 wire nail price in May is coming out. Some companies have worked off most of their accumulation at the low price and are entering orders at today's level. Makers will not accept contracts from the jobbers for more than 60 days ahead and on requirement contracts to the manufacturing trade which extend beyond Sept. 1, advances up to $2 a ton are being made. Deliveries range from three weeks upward. Wire prices are firm and we quote the present market as follows:

Wire nails, jobbers' carload lots, $1,70; retailers' carload lots, $1.75; painted barb wire, jobbers' carload lots, $1.70; retailers' carload lots, $1.75, with 30c for galvanizing; plain wire to jobbers in carloads, $1.50, and to retailers in carloads, $1.55; polished staples, $1.70; galvanized staples, $2.

Wire Rods.—Open-hearth rods are showing stronger, but little business is being done at today's level since important consumers are covered. Specifications are good. We quote present prices at $29 Pittsburg on Bessemer and $30 Pittsburg on open-hearth rods.

Coke.—Foreign labor which left the coke regions during the business depression to return to its native countries, is now coming back quite freely and any shortage of mine or oven operatives at present existing, promises to be short-lived. Some companies have met with difficulty in getting sufficient workmen to run increased operations and the instances reported have generally been in regard to oven labor. The market is quiet as to new business, but some foundry consumers are specifying rather heavily. The Jamison Coal & Coke Co. has withdrawn all outstanding quotations on foundry coke, as it has disposed of 85 per cent of its estimated output over the balance of the year. It is now quoting on specific inquiries. The company is also well sold up on furnace coke. We quote spot furnace coke at from $1.50 to $1.60 ovens and on contract from $1.60 to $1.75 ovens according to grade. On first class Connellsville foundry coke, the range is from $1.80 to $2 ovens for prompt shipment and on contract from $1.90 to $2.25 ovens. The *Courier's* figures for the week ending June 26 show 28,665 ovens active with an output of 320,634 tons compared with 28,069 active ovens and a production of 307,014 tons the previous week.

Old Material.—The present season of mid-year shut-down among iron and steel plants has left its effect upon the old material market, as consumers are not inclined to take on much tonnage while inventories are under way. The presence of some speculation among dealers in the market, notably in sheet scrap, has caused some higher prices. A new open-hearth interest in this district has recently entered the market and taken on about 2,000 tons of heavy steel. The Pennsylvania lines west in closing on their list the past week realized good prices for their steel and accepted a bid of $16.50 delivered in this territory for their long rails. The Pennsylvania railroad is offering to close July 12, an accumulation of 7,200 tons long rails, 500

tons of iron rails and a shop list somewhat lighter than usual. We quote gross tons delivered in the Pittsburg district as follows:

Heavy melting scrap, $15.50 to $16; rerolling rails, $16 to $16.50; bundled sheet scrap, $13.50 to $14; iron axles, $22 to $23; old iron rails, $18.50 to $19; No. 1 wrought scrap, $15.50 to $16; old car wheels, $15.50 to $16; low phosphorus, $19 to $20; machine shop turnings, $11.25 to $11.75; cast borings, $9.25 to $9.75; No. 1 cast scrap, $15 to $15.50; malleable, $15 to $15.50; stove plate, $11.50 to $12.

CHICAGO.

Leading Harvester Interest Appears as Heavy Buyer of Pig Iron.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, July 6.

The first step towards the fulfillment of the long anticipated plan of making Chicago a basing center was made last week when the Carnegie Steel Co. announced an advance of $1 a ton in bars, plates and shapes, placing the former on the basis of 1.25c Pittsburg and the two latter at 1.35c. The Illinois Steel Co. does not participate in this advance, but continues to quote bars at 1.38c, and plates and structurals at 1.48c, which is the former Pittsburg price plus the freight rate. This differential in favor of the local mills will be continued, it is said, until eastern prices more nearly approach the Chicago level; and what steps will be taken then is problematical, although with the gradual completion of the Gary plant it is the Steel Corporation's policy increasingly to deflect all western tonnage to its western mills. One exception in this price policy is the Inland Steel Co., whose plant is at Indiana Harbor. This company advanced its price coincident with the action of the Carnegie Steel Co., and continues to quote on the Pittsburg basis. It is practically sold up, however, for the balance of the year. Pig iron had the center of the local stage last week. There was heavy buying, especially of malleable, and prices of both northern and southern irons advanced 50 cents a ton. Billets are very strong and scarce, and are now quoted at $28 a ton. No recession is noted in the demand for fabricated shapes. It is reported that the total contracts let throughout the United States for this material during the first half of the year, slightly exceeded 650,000 tons, which is nearly one-half the annual capacity, this being estimated at 1,500,000 tons. The Inland Steel Co. is making plans for additions to its sheet mills, doubling its present capacity.

Pig Iron.—Considerable activity prevailed last week, and under the stimulus of heavy buying prices of northern iron were moved up to the basis of $17 Chicago for No. 2 foundry, and to $12.50 Birmingham for the same grade of southern iron. The advance in Alabama irons was largely the result of the withdrawal from the market of all the large producers, but the rise in the Chicago product is directly attributable to the heavy malleable commitments that were placed last week. The largest contract was that of the leading harvester interest, whose purchases are variously estimated at from 20,000 to 50,000 tons. A portion of this tonnage was placed with southern furnaces, but the greater part of it was divided between Chicago and Milwaukee producers. Authentic details regarding the transaction cannot be learned, but it is understood that the deliveries extend into 1910, and that the price at which the entire northern tonnage was placed was on a basis between $16 and $16.25 Chicago furnace. Jobbing malleable shops also bought heavily last week, especially those making a specialty of railroad castings; but although several tried to include 1910 deliveries at prevailing prices, it cannot be learned that any succeeded. The harvester transaction is said to have been arranged several weeks ago, but the options were not closed until last week. A radiator interest took 2,000 tons, supplementary to a large block of iron bought earlier in the year. The local furnaces have been placed in a very healthy condition by the week's developments, and it is their purpose henceforth to adhere more strictly to grading than has been the case in the past six months, when, owing to the light demand and strong competition, it was common to give a higher analysis than the grade purchased called for. We have revised our prices, and quote for Chicago delivery, as follows:

Lake Superior charcoal	$19.50 to 20.00
Northern foundry No. 1	17.50
Northern foundry No. 2	17.00
Northern foundry No. 3	16.50
Southern foundry No. 1	17.35
Southern foundry No. 2	16.85
Southern foundry No. 3	16.35
Southern foundry No. 4	15.85
Southern No. 1 soft	17.35
Southern No. 2 soft	16.85
Southern gray forge	15.35
Southern mottled	15.10
Southern silveries, 4 per cent silicon	17.35 to 17.85
Southern silveries, 5 per cent silicon	17.85 to 18.35
Southern silveries, 6 per cent silicon	18.85 to 19.85
Jackson Co. silveries, 6 per cent	19.90
Jackson Co. silveries, 8 per cent	20.90
Jackson Co. silveries, 10 per cent	21.90
Malleable Bessemer	17.00
Standard Bessemer	17.65 to 17.90
Alabama basic	16.85

Billets.—A local mill has advanced its price on forging billets to the basis of $28 Chicago, base. This is the best price obtainable here for nearby deliveries. Rolling billets were quoted last week at $26 Chicago on an inquiry of 500 tons from the Kansas City Bolt & Nut Co.

Merchant Bars.—The market appears to be in excellent condition. Specifications are very active, and new tonnage is considered exceptional for this time of the year. The Carnegie Steel Co. and Inland Steel Co. advanced their prices last week on steel bars, $1 a ton, making the basis 1.25c Pittsburg. The Illinois Steel Co. has now followed suit, but continues to maintain the old schedule of 1.38c Chicago, which is based on a Pittsburg price of 1.20c. This price will be maintained, it is understood, for an indefinite period, in accordance, doubtless, with the intention of making Chicago a basing center. Some price cutting has appeared in this market in steel bands, a sale having been made last week on the basis of 1.15c Pittsburg. Bar iron is firm at a minimum of 1.35c Chicago for third quarter requirements, and 1.40c for fourth quarter. We quote, for Chicago delivery, as follows:

Bar iron, 1.35c to 1.40c; hard steel bars, 1.25c to 1.30c; soft steel bars and bands, 1.38c, half extras; soft steel angles, less than 3 x 3, 1.48c; hoops, 1.78c base, full extras, planished or smooth finished tire steel, 1.58c; iron finish, up to 1½ x ½-inch, 1.53c base tire card; iron finish, 1½ x ½-inch and larger, 1.38c base steel card; channel for solid rubber tire, ¾ to 1 inch, 1.88c, and 1⅛-inch and larger, 1.78c; smooth-finished machinery steel, 1.63c; flat sleigh shoe, 1.43c; concave and convex sleigh shoe, 1.63c; cutter shoe, 2.75c; toe calk steel, 1.93c; railway spring steel, 1.78c, base vehicle card; crucible, 1.73c, base steel card; vehicle spring tool steel, 7c to 9c, with higher prices asked on special grades. Quotations on shafting are 60 per cent off the list for carload lots, and 55 per cent off for less than carload lots, carload freight allowed to points in base territory. On iron and steel bars from local stocks, we quote as follows: Bar iron, 1.70c to 1.80c base, full extras; soft steel bars, 1.60c per 100 pounds base, plus half extras; soft steel hoops, 2.20c, full extras.

Plates.—It is noted that the demand for sheared plates is in excess of that for universal. The universal mill at South Chicago is running very light and can give immediate deliveries, while the sheared plate mill is 30 days

behind its orders. The specifications and new tonnage for these keep up at a satisfactory rate. The advance in the Pittsburg schedule from 1.30c to 1.35c, has not been followed by the Illinois Steel Co. This interest continues to quote 1.48c Chicago, and will continue to do so until its own conditions justify a change. We quote for Chicago delivery from local mills as follows:

Tank plates, ¼-inch thick, 6¼ to 100 inches, 1.48c. For extras see Pittsburg report. Store quotations are without change, as follows:

Tank steel, ¼-inch and heavier, up to 72 inches wide, 1.70c; from 72 inches wide to 96 inches wide, 1.80c; 3/16-inch up to and including 60 inches wide, 1.80c to 1.85c; 72 inches wide, 2.05c to 2.10c; No. 8 up to 60 inches wide, 1.80c to 1.85c. Flange and head quality, 25c extra.

Sheets.—Announcement is made by the Inland Steel Co. that it will shortly commence the construction of an addition to its sheet mill that will increase its capacity to 10,000 tons monthly, or to double its present output. The market is very firm on all gages of sheets, both black and galvanized, and on blue annealed the local mill is obtaining premiums of $1 to $2 a ton. Store trade is also very brisk and prices firm.

For mill prices, see Pittsburg report. Freight to Chicago, 18 cents. We quote store prices at Chicago as follows:

No. 10, 2c to 2.10c; No. 12, 2.05c to 2.15c; No. 14, 2.10c to 2.20c; No. 16, 2.20c to 2.30c; Nos. 18-20, 2.50c to 2.55c; Nos. 22-24, 2.55c to 2.60c; No. 26, 2.60c to 2.65c; No. 27, 2.65c to 2.70c; No. 28, 2.75c to 2.80c; No. 30, 3.05c; galvanized sheets, Nos. 10 to 16, 3c to 3.10c; Nos. 18 and 20, 3.05c to 3.15c; Nos. 22 to 24, 3.20c to 3.25c; No. 26, 3.40c to 3.45c; No. 27, 3.60c to 3.65c; No. 28, 3.80c to 3.90c; No. 30, 4.20c to 4.50c.

Structural Steel.—A very recent compilation of the contracts let for fabricated material since Jan. 1 in all parts of the United States showed the tonnage to be 650,000. The total output of the country is estimated by competent authorities to be 1,500,000 tons annually. Inasmuch as more than half of the tonnage closed was let in the last three months of the first half, it will not take very long at the present rate of buying to fill all the shops of the country. Contracts let last week include the Farmers' & Mechanics' Bank, San Francisco, 100 tons, to the Mortensen Construction Co., San Francisco; Prager building, San Francisco, 380 tons, let to the Ralston Iron Works, same city; addition to Colorado building, Denver, 100 tons, let to the American Bridge Co.; Alpine State Tabernacle, Salt Lake City, 100 tons, let to the H. A. Silver Foundry Co., same city; Davenport Locomotive Works, Davenport, Ia., 510 tons, let to the McClintic-Marshall Construction Co.; King Phillip Copper Co., Winona, Mich., 325 tons, let to the Wisconsin Bridge Co.; railroad bridge, Ottumwa, Ia.; for the C., M. & St. P., 700 tons, let to the Toledo-Massillon Bridge Co.; C., M. & St. P. bridge at Des Moines, 335 tons, let to the Fort Pitt Bridge Works, Pittsburg; eight highway bridges in Henry county, Ill., let to the Joliet Bridge & Iron Co. The addition to the blacksmith shop of Allis-Chalmers Co., 500 tons, has not been let yet. Neither has the contract been awarded for the addition to the Rothschild building (Isham estate), Chicago, 1,150 tons. A large tonnage is expected in the near future from the Pacific coast, the Oregon short line being one of the roads that is contemplating extensive improvements in its roadbed and buildings.

We quote mill prices for structural shapes, Chicago delivery, on the basis of 1.48c for beams and channels, 15-inch and under. For extras see Pittsburg report. Local store prices are as follows:

All angles, 3 inches and larger, including 6 inches, $1.70 per 100 pounds; angles over 6 inches, $1.80 per 100 pounds base; beams, 3 to 15 inches, inclusive, $1.70 per 100 pounds base; channels, 3 inches and larger, $1.70 per 100 pounds base.

Rails and Track Supplies.—So far as actual tonnage is concerned, the week under review was quiet. There was a total inquiry for 30,000 tons of standard sections of which 5,000 tons of open-hearth rails was placed. In addition, 3,000 tons of miscellaneous lots were let. The plentiful supply of money and low rate of interest is bringing out a lot of projected steam and traction enterprises. One such enterprise now figuring on its rail requirements is inquiring for 12,000 tons. The specifications for track supplies are very heavy. New tonnage is also of good volume. On track bolts the local mill is practically out of the market for the balance of the year. The Northern Pacific is said to be contemplating equipping all its lines and tracks with steel tie plates, and, if this determination is reached, a very large tonnage of this and other track material will be required. Light rails are very active, June being the best month of the year for the local mill in this material.

See Pittsburg report for prices on standard sections. On light rails, Chicago delivery, we quote as follows:

Light rails, 40 and 45-pound, $26; 30 and 35-pound, $26.75; 16, 20 and 25-pound, $27; 12-pound, $28. In lots of 250 to 500 tons a reduction of 60 cents a ton from these prices is made; lots of 500 tons and up carry a reduction of $1 a ton. Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; railroad spikes, 1.75c to 1.85c; smaller sizes spikes, 1.85c to 1.95c base; track bolts, with square nuts, 2.15c to 2.20c; with hexagon nuts, 2.30c to 2.40c.

Merchant Pipe and Boiler Tubes.—Demand continues of normal proportions with apparently nothing to improve or mar it. We quote for lap-welded tubes out of store 65 off, and for charcoal 50 off. For mill discounts, see Pittsburg report.

Cast Iron Pipe.—No tonnage of any moment was contracted for last week. There was considerable inquiry, in small lots, from the west, the largest being from Arapahoe, Neb., which is in the market for 300 tons. The letting will occur on July 16. Prices are without change, as follows: Four-inch water pipe, $27.50; 6 to 14 inches, $26.50; larger sizes, $25.50; gas pipe, $1 a ton higher.

Wire Products.—So far as new tonnage is concerned, the buying is quiet and an improvement is not looked for before Aug. 1, when the active demand for fall stocks commences. Specifications are excellent, however, especially for nails and smooth wire. The leading interest is still behind on its deliveries. There is no change in prices, but they are very firm. An advance is expected around Aug. 1. We quote to jobbers, Chicago delivery, as follows:

Wire nails, jobbers' carload lots, $1.88; retailers' carload lots, $1.93; retailers, less than carload lots, $2.03; painted barb wire, jobbers' carload lots, $1.88; retailers' carload lots, $1.93, with 30c for galvanizing; plain wire to jobbers in carloads, $1.68; staples, $1.88. Wire rods, Bessemer, $27; open-hearth, $28; chain rods, $27; f. o. b. Pittsburg.

Old Material.—This is strictly a buyers' market. Consumers are so well entrenched in the way of stocks and commitments that scarcely anything interests them unless the price is attractive. Dealers are holding on to their stocks, anticipating an early stiffening of the market, but on ma-

terial in transit or on track they are making concessions in order to move it rather than pay demurrage. The report that there is a short interest in this market is not well founded, judged by the indifferent support given to a waning situation. Some large lists have been offered of late by railroads, but in most instances they have been sold direct to consumers. Not enough of a change has occurred to justify any change in our prices, and we continue to quote as follows, gross tons being in the first paragraph:

Old car wheels	15.50 to 15.75
Old iron rails	17.00 to 17.25
Rerolling rails (4 ft. and over)	15.75 to 16.00
Old steel rails (2 ft. and under)	15.25 to 15.50
Light section relayers, 45 lbs. and under subject to inspection	21.00 to 23.00
Relaying rails, subject to inspection	19.00 to 19.50
Frogs, switches and guards	14.25 to 14.50
Heavy melting steel	14.00 to 14.25

We quote, net tons, as follows:

No. 1 R. R. wrought	$13.25 to 13.50
No. 2 R. R. wrought	12.25 to 12.50
Knucklers, couplers and springs	13.25 to 13.50
Shafting	15.25 to 15.50
Iron car axles	18.00 to 18.25
Steel car axles	17.25 to 17.50
Dealers' forge No. 1	10.75 to 11.00
Pipes and flues	9.75 to 10.00
No. 1 cast, 150 lbs. and less	13.50 to 13.75
No. 1 mill	7.25 to 7.50
No. 1 busheling	10.75 to 11.00
Mixed busheling	8.00 to 8.25
No. 1 boiler cut	10.00 to 10.25
Boiler punchings	13.25 to 13.50
Cast borings	6.00 to 6.25
Mixed borings, etc	6.00 to 6.25
Machine shop turnings	8.00 to 8.25
Railroad malleable	12.75 to 13.00
Agricultural malleable	11.25 to 11.75
Stove plate and light cast scrap	11.50 to 11.75
Old iron splice bars	15.75 to 16.00

CLEVELAND.

Considerable Activity in Pig Iron—Carnegie Shapes for Viaduct.

Office of THE IRON TRADE REVIEW, Browning Building, July 6.

Iron Ore.—Increasing interest is shown in the ore market, and furnace men are coming to realize the necessity of making contracts before it is too late. In one case, a furnace interest asked an ore company to give it an option until Aug. 1 on a good tonnage of ore, but this proposition was declined. It is expected that the ore movement for July will be fully up to that of June.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.50; Mesabi Bessemer, $4.25; old range non-Bessemer, $3.70; Mesabi non-Bessemer, $3.50.

Pig Iron.—Some activity is noticeable in the local market, and sales aggregating from 2,000 to 3,000 tons for Cleveland foundries have been made within a few days. Inquiry from outlying territory is also good. Prices have not changed, but are firm at recent quotations. We quote delivered in Cleveland as follows:

No. 1 foundry	$16.00 to 16.25
No. 2 foundry	15.50 to 15.75
No. 3 foundry	15.00 to 15.25
No. 2 southern	15.85
Gray forge	14.90 to 15.00
Bessemer	16.00 to 16.15
Lake Superior charcoal	19.00 to 19.50
Jackson Co. 8 per cent silvery	20.05

Coke.—There is very little activity in the market, and price concessions are still being made for spot delivery. We quote spot furnace coke at $1.50 to $1.65 at the owners, and on contract $1.70 to $1.75. For first class Connellsville foundry coke we quote $1.80 to $2 for spot, and on contract $2 to $2.25.

Finished Materials.—Deliveries are gradually being delayed, and very little material can now be obtained in less than six weeks. Heavy plates are perhaps an exception to this rule. The 6,000 tons of structural material for the Denison-Harvard bridge, which has finally been awarded to the McClintic-Marshall Construction Co., will be furnished by the Carnegie Steel Co. The leading interest is now quoting steel bars at 1.25c Pittsburg, and plates and shapes at 1.35c, and some independent interests have advanced their quotations on bars to 1.30c, and 1.40c on shapes and plates. No important building projects are pending at present, but a large number of buildings which do not require much steel are being planned.

Old Material.—The sagging tendency that has been the chief characteristic of the market since the middle of June has been checked and seems to be succeeded by a firmer undertone. No changes in prices were noted this week, and some small quantities of material are changing hands. We continue to quote f. o. b. Cleveland as follows:

Old iron rails	$16.50 to 17.00
Old steel rails (re-rolling)	15.00 to 15.50
Old steel rails (under 6 feet)	15.00 to 15.50
Old car wheels	15.50 to 16.00
Old steel boiler plate	12.25 to 12.75
Mallable iron (railroad)	14.00 to 14.50
Steel axles	18.00 to 18.50
Malleable iron (agricultural)	13.00 to 13.50
Heavy steel	14.00 to 14.50
Country mixed steel	12.50 to 13.00
Low phosphorus	16.00 to 16.50

We quote, net tons, as follows:

No. 1 R. R. wrought	$14.00 to 14.50
No. 1 busheling	12.00 to 12.50
No. 1 machine cast	12.50 to 13.00
Iron axles	17.50 to 18.00
Axle turnings	10.00 to 10.50
Machine shop turnings	8.50 to 9.00
Grate bars	11.00 to 11.50
Pipes and flues	11.50 to 12.00
Tank iron	10.00 to 10.50
Hoop and band iron	9.00 to 9.50
Sheet iron	8.00 to 8.50
Wrought drilling	8.50 to 9.00
Stove plate	11.00 to 11.50
Cast borings	7.50 to 8.00

CINCINNATI.

Leading Harvester Interest Buys About 15,000 Tons of Southern Iron.

Office of THE IRON TRADE REVIEW, First National Bank Bldg., July 6.

Pig Iron.—Most of the southern pig iron furnaces are now asking $12.50 Birmingham for No. 2 foundry. Some are holding for $13. There have been no sales of importance made on the higher basis and the market has not been established at $12.50 Birmingham, but so far as can be learned this seems to be the asking figure. It can not be said, however, that $12 iron has disappeared as yet, as there is considerable speculative iron which could be sold profitably at $12 and the market has not been tested. There seems to be no inquiry or pending business under consideration in this market in which southern iron is concerned. The heaviest purchases made this week were by the International Harvester Co. The tonnage purchased amounted to close to 15,000 tons, mostly for third quarter delivery and the prices ranged from $11.50 to $12 Birmingham on this iron. A manufacturer of sewing machines in Ohio bought 1,500 tons, part northern and part southern, at about market levels. A consumer of malleable iron is figuring on about 2,000 tons of this iron with southern Ohio furnaces. Northern iron remains quotable at $14.50 at furnace in southern Ohio, for No. 2 foundry or malleable. The southern pig iron market is difficult to quote this week owing to the sudden advance in prices at which furnaces are holding their iron and the fact that practically no sales have been made since the 50 cents per ton was added to the selling basis. There are those in the trade who believe that, on a legitimate inquiry from a consumer, $12 could still be done and the market is therefore quotable at $12 to $12.50 Birmingham with the tendency toward the top quotation. We quote for third quarter delivery delivered Cincinnati, based on freight rates of $3.25 from Birmingham and $1.20 from Ironton as follows:

Southern foundry No. 1	$15.75 to 16.25
Southern foundry No. 2	15.25 to 15.75
Southern foundry No. 3	14.75 to 15.25
Southern foundry No. 4	14.25 to 14.75
Southern No. 1 soft	15.75 to 16.25
Southern No. 2 soft	15.25 to 15.75
Southern gray forge	13.75 to 14.25
Northern No. 1 foundry	15.95 to 16.20
Northern No. 2 foundry	15.70
Northern No. 3 foundry	14.95 to 15 20
Jackson county 6 per cent silicon	18.70
Jackson county 8 per cent silicon	19.70
Jackson county 10 per cent silicon	20.70

Finished Material—The market remains firm in tone. There is not much doing in the way of mill orders, but

prices are well maintained. One large interest has advanced its price on steel bars to 1.30c Pittsburg. For iron bars 1.45c Youngstown is asked by the same interest. Specifications on contracts have been fairly good. Jobbers are reporting an increased demand.

Coke.—There has been no change in prices. The movement has not materially changed in volume. Foundry contracts are mostly made for the last half of the year. Spot coke is steady. The inside prices given below represent the market for spot coke, and the outside figures are for long time contracts. Prices in the leading producing districts are as follows:

	Per Ton.
Wise county furnace coke	$1.60 to 1.85
Wise county foundry coke	2.00 to 2.25
Pocahontas furnace coke	1.65 to 1.85
Pocahontas foundry coke	1.75 to 2.25
Standard Connellsville furnace coke	1.60 to 2.00
Standard Connellsville foundry coke	2.00 to 2.25

Old Material.—There is not much life to the market and an easy tone prevailed with no material change in prices.

Old No. 1 R. R. wrought net tons	$13.50 to 14.00
No. 1 machinery, net tons	13.00 to 13.50
Old iron rails, gross tons	15.00 to 16.00
Old steel rails (re-rolling) gross tons	14.00 to 14.50
Old short lengths, gross tons	13.50 to 14.00
Old iron axles, net tons	17.00 to 17.50
Heavy melting scrap, gross tons	13.00 to 13.50
Stove plate, net tons	10.50 to 11.00
Heavy turnings, net	9.50 to 10.00
Cast borings, net tons	7.50 to 8.00
Car wheels	14.00 to 14.50

NEW YORK.

Cast Iron Pipe Makers Buy Pig Iron —Mil Activity Continues.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., July 6.

Pig Iron. — The holiday season apparently has had no effect in checking the activity recently noted in this section. Consumers of foundry, basic and pipe iron are still in the market for good amounts and prices continue firm at the new levels recently established. Three or four manufacturers of cast iron pipe, largely in the eastern Pennsylvania district, have closed for an aggregate of 25,000 tons of low grade irons during the past 10 days, partly southern, but principally northern iron, and the price is now well established at $15.50, delivered, for the latter. About the same tonnage of basic is still under negotiation, only one small lot of that recently inquired for having been closed; the minimum is $15.50, delivered. Both northern and southern foundry are firm, and the principal producers in the Alabama field are now holding out for the $12.50 basis; one large tonnage offered a leading seller during the week on a $12 basis was turned down, although it was for almost immediate shipment. Northern foundry is in good demand and sales have totaled a considerable figure. We quote, prompt and third quarter delivery, as follows:

Northern foundry No. 1	$17.00 to 17.50
No. 2X foundry	16.50 to 17.00
No. 2 plain	16.00 to 16.50
No. 2 southern foundry	16.50 to 17.00
Malleable	17.25 to 17.75
Gray forge	15.50 to 15.75

Ferro-Alloys. — Sales of ferro-manganese during the week included one lot of 1,000 tons and another of 500 tons, both for western shipment, but there is little additional business in prospect. The current level is $41.50, seaboard, for prompt or last half shipment, $42 for last quarter only, and $43 for first half. About 200 tons of ferro-silicon have been sold at $62 to $63, Pittsburg, and inquiries are current for about 600 tons.

Finished Materials. — The second half opens with encouraging reports from practically all branches of the steel trade. Structural shops are well supplied with orders and specifications for the summer months, and are not so aggressive for business as has been the case. There are persistent rumors that a further advance on shapes, plates and bars is imminent, and some substantiation is afforded by the fact that current prices are extremely well maintained. Developments of the week, which will ultimately involve a large tonnage, include the Interborough Rapid Transit Co.'s offer to build 68½ miles of new track, the announcement that two city blocks will be covered by a $6,500,000 building running from Forty-sixth to Forty-eighth streets on Lexington avenue, and the lease by the Bankers' Trust Co. of a Wall Street site for a 16-story office and bank building.

One of the largest makers of billets reports its capacity as oversold and the demand as remarkably heavy for this time of year. In almost every case where a consumer has contracted for a minimum and maximum tonnage, the latter has been specified and some purchasers already have their specifications in three months ahead. The hardware trade, which is a large billet user, is apparently increasing at a rapid rate.

Current activities of the Steel Corporation are at the rate of 87 per cent, if the Tennessee company is considered, or about 91 per cent if not. Stocks of pig iron are reported as almost the lowest in history, and the immense quantity of iron which is now being worked up in finished products can be understood from the fact that, unless unforseen contingencies arise, the July pig iron production of the Corporation will be the largest of any month since its formation.

Increased activity is reported among railway equipment concerns. The Cananea Consolidated Copper Co. is in the market for 8,000 tons of standard rails, and 3,250 kegs of spikes, for which there is a heavy demand. The Virginia Bridge & Iron Co. will build 1,000 car bodies for the Norfolk & Western, the railroad to make its own trucks and wheels. The Atlantic Coast Line is in the market for 500 steel underframe box cars and 50 all-steel phosphate cars. The Pennsylvania Steel Co. will furnish 1,700 tons of bridge work for the Grand Trunk. A brisk demand is noted for angle bars, frogs and switches.

Eastern ship yards have made heavy bookings of late. The Maryland Steel Co. has recently taken orders for five large vessels and has all its ways full; the New York Ship Building Co. has booked three boats of considerable tonnage for the Coast Transportation Co.; Cramps have taken some good orders, and the Harlan & Hollingsworth Corporation will build the successor to the Horatio Hall, all of these projects requiring a good tonnage of plates. The Texas Oil Co. has let the contract for two oil barges to the Staten Island Ship Building Co.

Negotiations are still on looking to the formation of a second bar iron combination, but details are not available. We quote: Angles, 3 to 6 inches x ¼-inch and heavier, 1.46c; beams, 3 to 15 inches, 1.46c; tees, 3 x ¼-inch and heavier, 1.51c; plates, carloads, tank, 1.46c; marine boiler, 1.86c; bar iron, 1.40c to 1.45c; soft steel bars, 1.36c; sheets, No. 28 black, 2.56c.

Old Materials. — Taking advantage of the holiday dullness, mills have reduced their offering price for heavy melting steel to $15.25 or $15.50, delivered, but are securing little material at these figures. At the $16 price some 12,000 tons was taken in. Railroad lists of the month are normal. We quote, gross tons, New York delivery, as follows:

Old steel rails (rerolling)	$13.50 to 14.50
Relaying rails	19.00 to 19.50
Old car wheels	13.50 to 14.00
Old iron car axles	20.00 to 20.50
Old steel car axles	18.00 to 18.50
Heavy melting steel	13.00 to 13.50
No. 1 railroad wrought	15.50 to 16.00
Iron track scrap	13.50 to 14.00
Wrought pipe	12.00 to 12.50
Cast borings	7.50 to 8.00
Wrought turnings	9.00 to 9.50
Heavy cast scrap	12.50 to 13.00
Railroad malleable	11.50 to 12.00
Stove plate	10.00 to 10.50
Grate bars	10.00 to 10.50

An accident to the hoisting apparatus compelled the Napier Iron Co., Nashville, Tenn., to bank the Napier stack for five days in June.

PHILADELPHIA.

Cast Iron Pipe Makers Negotiating for Large Tonnage of Pig Iron.

July 6.

Pig Iron.—The holiday quiet has been felt with considerable force during the week under review, and the volume of sales has shown an appreciable decrease. The market has lost none of its strength, however, and in certain lines, notably pipe irons, substantial advances have been made. During the past 10 days cast iron pipe manufacturers have been negotiating for close to 30,000 tons, but scarcely half of this tonnage has been placed because of the variance between the ideas of makers and melters. The heaviest purchaser was the Delaware River works, which recently secured the 14,000-ton pipe contract for New York City; this interest covered a good part of its requirements by taking on northern iron from a couple of neighboring furnaces, but has not purchased up to its full requirements. Virginia pipe works have been active buyers of late and the leading interest is in the market for a round tonnage. On recent sales the prevailing price was $15.25, delivered, but offers under $15.50 are now being declined. The inquiry of an eastern mill for 5,000 tons of September basic has been closed, the price being about $15.50, delivered, but this was apparently the only transaction of importance during the week. No further activity in low phosphorus or malleable iron is reported. Moderate sales of foundry continue plentiful, the price range for No. 2X being $16.75 to $17, delivered, for choice grades, early shipment, and $17 to $17.25 for fourth quarter. The foundry melt continues to improve and in this section is now from 60 to 85 per cent of normal. The Pennsylvania railroad tonnage has been closed, 8,100 tons in all. Shelby iron being the southern brand purchased, and Lake Superior the northern. We quote, third quarter delivery at eastern Pennsylvania plants, as follows:

No. 1X foundry	$17.00 to 17.50
No. 2X foundry	16.50 to 17.00
No. 2 plain	16.00 to 16.50
Standard gray forge	15.25 to 15.75
Basic	15.50
Low phosphorus	19.00 to 20.00
No. 2 Birmingham	15.75 to 16.25
No. 2X Virginia	16.75 to 17.25
No. 2 plain Virginia	16.25 to 16.75

Finished Materials.—Bids go in July 12 on the Franklin Hotel building, Broad and Spruce, for which probably 2,500 tons of steel will be needed. This project was up some three years ago. Jas. G. Doak & Co. have the general contract. Bids close this week on the Casey Grand hotel at Scranton, 700 tons, but this may not be erected immediately; the owners are taking all bids direct. The Carlucci Stone Co. is receiving figures on 600 tons of steel for the Traders' National bank at Scranton; another bank building and a large grain elevator are under negotiation at Richmond; the Kemper Construction Co. is in the market for 300 tons of steel for a school building at Atlantic City; and bids are to be opened July 12 on a tent and storage building in connection with the Harrisburg arsenal, from 300 to 400 tons of steel being required. The Phoenix Iron Co. has taken 1,200 tons for the Davison Chemical Co. factory building at Baltimore, and the Stroebel Construction Co. is low bidder on the Passyunk Avenue bridge in this city, 1,500 tons, but may sublet the contract to a local interest. James G. Doak & Co. are low on the Homeopathic hospital building in Hanover township, requiring a good tonnage.

Steel mills in this district generally found June one of the heaviest months in a long while, and are now considerably behind on deliveries, particularly on shapes and bars. Ship yard orders continue light, but railroad inquiries are holding up well. The Baltimore & Ohio is in the market for 5,000 kegs of spikes and the trade expects something definite in regard to its rumored car order at an early date. We quote: Structural shapes, 1.45c to 1.55c; plates, 1.45c to 1.55c; sheets, No. 28, 2.80c; steel bars, 1.40c to 1.45c; refined bar iron, 1.40c to 1.50c.

Old Material.—The market is quiet and shows slight declines in certain lines, this being occasioned by the closing of mills over the holidays, the forcing of a few lots upon the market and the continuance of the Bethlehem embargo, caused by the changing of tracks. Dealers report numerous technical rejections of scrap at Steelton. Sales of the week have been confined to a number of 500-ton lots of heavy melting steel, the price ranging from $15.75 to $16, but holders of accumulations are unwilling to sell at the lower prices now offered by the mills. We quote, gross tons, eastern Pennsylvania delivery, as follows:

Old steel rails (rerolling)	$16.75 to 17.25
No. 1 steel scrap	15.75 to 16.25
Old steel axles	21.00 to 21.50
Old iron axles	23.50 to 24.00
Old iron rails	19.50 to 20.00
Old car wheels	15.50 to 16.00
Choice scrap R. R. No. 1 wrought	17.00 to 17.50
No. 1 yard scrap	16.00 to 16.50
Machinery scrap	15.00 to 15.50
Low phosphorus scrap	20.00 to 20.50
Wrought iron pipe	15.50 to 16.00
No. 1 forge fire scrap	13.50 to 14.00
No. 2 forge fire scrap, ordinary	9.50 to 10.00
Wrought turnings	12.50 to 13.00
Axle turnings, heavy	13.00 to 13.50
Cast borings	10.50 to 11.00
Stove plates	12.50 to 13.00

BUFFALO.

Leading Radiator Interest Buys a Large Tonnage.

Office of THE IRON TRADE REVIEW,
932 Ellicott Square, July 6.

Pig Iron.— Orders placed by the leading radiator company in this district amount to about 20,000 tons for plants at Buffalo and Titusville. The tendency toward stiffer prices continues, but without any notable change in quotations. The minimum price of $14.75 on No. 2X foundry, as quoted below, is not a general price and certain interests decline business at a price 75 cents higher, but some tonnage is selling at that figure, and probably will be sold at similar prices in odd lots for prompt delivery for a week or two. The belief in an early break for advanced prices is still unshaken, although reports from other iron centers have, in some instances, caused slight depression. Demand for southern tonnage is light and offerings at this point are small and mostly for third quarter. Here there is a general confidence that market conditions will gain in strength. In the foundries, however, business has been none too good and some interests are running very light, but they, too, expect a substantial betterment. There is some concern felt here owing to the summer season, which often delays improvement in conditions and many feel that they will have to wait until Sept. 1 for the encouragement they want. For third quarter delivery the following general prices prevail, with higher quotations for last quarter business:

No. 1X foundry	$15.25 to 15.75
No. 2X foundry	14.75 to 15.25
No. 2 plain	14.50 to 15.00
No. 3X foundry	14.25 to 14.75
Malleable Bessemer	15.00 to 15.50
Gray forge	14.25 to 14.75
Charcoal	19.50 to 20.50

Finished Products.—The past week has shown healthy activity in finished iron and steel. This week opened generally quiet here. The Buffalo Realty Co. let the contract for erecting three additional stories on the William Hengerer building to the Buffalo Structural Steel Co. The tonnage includes 300 tons of structural. The W. H. Granger building will be built by H. C. Hassomer & Co., 500 tons structural. Numbered among the contracts pending are: International Railway Co., six-story office building; George Irish Paper Co., addition to warehouse, 50 tons, mill construction; Phoenix Brewery, 300 tons structural, all Buffalo business. The American Bridge Co. received the contract for Brownsville (N. Y.) Paper Mill Co., 160 tons structural. The Custodial building at Rome, N. Y., 250 tons structural, will

be erected by A. E. Stephens & Co., having general contract. It was reported here today that the steel contract had also been placed. Announcement was made here today that the work of construction of buildings for the proposed Lackawanna Bridge Co.'s plant would be commenced immediately. Ground was broken several weeks ago.

ST. LOUIS.

Advance Sales of Pig Iron Are Being Made at Firm Prices.

July 6.

Pig Iron.—While the pig iron market in the St. Louis territory is not so active as it is reported to be in the eastern territory, local dealers say they are making small sales right along, with every indication that better times are within sight. No. 2 southern iron is said to be firm at $12, Birmingham, although an occasional price of $11.50 for prompt shipment is heard of. One sale of 1,200 tons of malleable iron was made by a local firm to a large foundry, but the selling price was withheld. Quotations of $14.50 for Ohio iron, with a freight charge of $2.50, are said to be about the average for that product. Our prices, delivered, to which the freight of $3.75 has been added, follow:

No. 1 southern	$15.75 to 16.25
No. 2 southern	15.25 to 15.75
No. 3 southern	14.75 to 15.25
No. 4 southern	14.25 to 14.75

Coke.—Quotations were unchanged last week, but some of the local dealers say they have received word that an advance of 10 cents a ton soon will be made by the Virginia interests. This will apply, if the advance is made, to shipments over the remainder of the year and first half of next year. Connellsville 72-hour grades are quoted at $2.15 to $2.25, ovens, for delivery over the balance of the year, while the best selected Connellsville furnace coke is bringing from $1.75 to $2 ovens for last half delivery.

Old Material.—Prices remain firm, as follows:

Cast iron borings, free from foreign material, net tons	$ 5.00 to 5.50
Steel axle turnings, gross tons	11.00 to 12.00
Steel railroad axles, net tons	17.00 to 18.00
Iron railroad axles, net tons	18.50 to 19.50
Miscellaneous steel scrap, gross tons	10.00 to 11.00
Old car wheels, gross tons	15.00 to 15.50
No. 1 railroad cast scrap, net tons	11.00 to 11.50
Heavy machinery cast, net tons	13.00 to 13.50
Stove plate and light cast, net tons	10.00 to 10.50
Sheet iron, net tons, uncut	4.00 to 5.00
No. 1 railroad wrought, net tons	12.00 to 13.00
Railroad malleable, net tons	12.00 to 12.50
Heavy melting steel, net tons	11.00 to 12.00
Relaying rails, net tons	17.00 to 18.00

BIRMINGHAM, ALA.

Important Interests Are Sounding the Pig Iron Market.

July 5.

Southern pig iron quotations have been advancing steadily until $12.50 per ton, No. 2 foundry, appears to be the minimum, and this price, $1 above what prevailed in June, has not stopped the demand altogether. The quotations are still looking up and within a few days another rise in the price is not improbable. Special brand and special analysis iron commands $13 per ton. The make has not been improved any during the past week nor has it been reduced any. The make is off to a considerable extent, not more than 19 furnaces being in blast and two of these on charcoal iron. Intentions are openly announced of blowing in three or four furnaces in the next few days in this district, but there has been something or other to delay the procedure. There is quite a large amount of iron on furnace yards in this district and every demand for iron can be taken care of. There is, however, a large quantity of iron being shipped out.

One of the large cast iron pipe concerns sounded the southern iron market during the past week, asking for bids on 25,000 tons, delivery during the last quarter of the year. Prices were made, but the negotiations have not come to a deal. Other large interests have been sounding the market also and indications are plain that there is need for much of the product and that southern furnace companies are going to enjoy continued prosperity.

SEATTLE.

Coast Recovers Slowly from the Long Period of Depression.

Office of THE IRON TRADE REVIEW,
302 Pioneer Bldg., June 26.

Continued activity in building lines is giving considerable tonnage to the foundries in the shape of columns, pedestals and other building castings. General business is good and the outlook is reassuring, but a careful review of the situation leads to the conclusion that the business revival is not yet as pronounced on the Pacific coast as it is in the east. The coast felt the depression later than the east and will be correspondingly late in the recovery. Money is tight and it is difficult to secure funds for anything but gilt edged propositions.

Pig Iron.—But little iron is being offered for mid-winter delivery. The market is generally quiet, although spot iron has stiffened a little on account of low stocks, there being practically no iron available at Puget Sound ports for immediate delivery. The ship Zinita with 1,000 tons is now a few days overdue, the ships Michelet and Celtic Monarch are due in September with about 1,500 tons of English No. 1, the steamer Kaga Maru will be in port June 24 with a small shipment of Chinese iron. The ship Matterhorn is due on the Columbia river in August with 1,000 tons. A 1,200-ton shipment from Europe is due in December on a vessel not yet chartered, and 1,000 tons will arrive in January on the Adolph, this iron having been transferred from the wrecked ship Skjold at the Cape Verde islands. We have revised our prices and quote as follows:

English, Cleveland No. 1, spot	$24.00 to 26.00
English soft No. 1, to arrive Dec.	21.50 to 23.00
English soft No. 1, to arrive Sept.-Oct.	23.00 to 23.50
Southern soft, No. 2 (domestic)	22.00 to 22.50
Glengarnock, Scotch, to arrive Sept.	25.00 to 25.25

Coke.—The Wilkeson Coal & Coke Co. is now prepared to supply the trade with foundry coke from the local ovens at Wilkeson, Wash. This announcement is of considerable importance to the foundrymen of the Pacific northwest; heretofore all the output of the Wilkeson ovens suitable for foundry purposes has been absorbed by the Tacoma smelter. Stocks of local coke are heavy; sales are fair. There is no foreign coke in the market at present. We quote net tons as follows: Wilkeson foundry coke, $6.50 at the mine, $7.30 f. o. b. Seattle; German syndicate coke to arrive December-January, $12.50 ex ship Puget Sound or Columbia river; Fernie, B. C., foundry coke, $9.50 f. o. b. Spokane.

Old Material.—The situation has changed but little since the last report. Good foundry scrap is still in demand and the dealers are giving no concessions from the ruling quotations. We continue to quote in net tons f. o. b. Seattle:

Foundry and machinery scrap	$19.00 to 21.00
Old car wheels	16.50 to 17.50
Railroad wrought	10.00 to 11.00
Country wrought and busheling	5.00 to 8.00

Merchant Iron.—Iron bars are the weakest feature in the market. The resale price is now down to $2.10 base and it is understood that there are some concessions even at this figure. Prices on steel have been reduced in proportion. The sales are heavy although the jobbers are not

seeking business at the present market level. Attempts to maintain an advance seem to meet with little success. The mills are operating at a fair gait. We quote base prices per 100 pounds, f. o. b. Seattle: Common iron bars, $2.10; soft steel bars, $2.20; machinery steel, $2.65; Norway iron, $3.40; angles, channels, zees and tees, under 3-inch, $2.75.

METAL MARKETS.

ST. LOUIS.

July 6.

Lead and Zinc.—The highest base price paid for low-grade minerals in the Oklahoma district last week was $46 a ton, while the high-grade ores from the Missouri camps sold for $44.50 to $45 a ton, base. The highest price reported for zinc ore was $47.50, on an assay base of $44.50 a ton. This was paid for Joplin ore running 63 per cent metallic zinc. There was a decided firmness in all ore prices. This probably was due to a reduction in the output on account of heavy rains, a steady spelter market at $5.35 a hundred pounds, and increased activity at several Kansas smelters which ceased operations recently because of a strike of workmen. When offered $45 as a base price, operators who had been holding surplus bids for higher figures, sold their stock readily. The stock of many small operators were closed out quickly, some of the smaller lots bringing very low prices. The offerings were less on Friday and Saturday than for the first part of the week, however, and there are indications for a stronger market this week. Quite a number of large concentrating plants in the Joplin district are preparing to begin operations soon.

The lead ore market was weak, the best price being $37 for 80 per cent ore. The bulk of the lead sold for $56.

The price of calamine was steady at $22 to $24 on large lots, but small sales were reported to have been made at from $16 to $20 a ton.

CHICAGO.

July 6.

The metal market has been quiet in the week under review. Prices have receded slightly, Lake copper, carload lots, being quoted at 13¾c to 14c; casting copper, 13¼c to 13½c; smaller lots, ¼c to ¾c higher. Spelter has declined from 5.35c to 5.45c; lead, desilverized, is without change at 4.50c to 4.60c in 50-ton lots; corroding, 4.75c to 4.85c in 50-ton lots; carlots, 2¼c per 100 pounds higher; sheet zinc $7 list f. o. b. LaSalle in car lots of 600-pound casks; Cookson's antimony, 10½c, and other grades, 9¾c to 10¼c.

While old metals continue without material change in price, the market is sentimentally weaker. We quote as follows:

Copper wire, 11¾c to 12c; heavy copper, 11½c to 11¾c; light copper, 10¾c to 11c; heavy red brass, 10¾c to 11c; heavy yellow brass, 8½c; light brass, 6¼c; No. 1 red brass borings, 9c to 9¼c; No. 1 yellow brass borings, 7¾c; brass clippings, 8¼c; tea lead, 3.60c; lead scrap, 3.90c; zinc, 3.60c; tin pipe, 24½c; tin foil, 23c; pewter, 17½c; electrotype plates, free from wood, 4c; electrotype dross, 2.90c; stereotype plates, 4⅛c; stereotype dross, 3c; prime slab zinc dross, $60 per ton.

NEW YORK.

July 6.

Metal prices at the close of business today were as follows: Copper, lake, 13¼c to 13⅜c; electrolytic, 13c to 13⅛. Copper Casting, 12¾ to 13. Pig Tin, 29c to 29⅛c. Pig Lead, 4.35c to 4.45c. Spelter, 5.40c to 5.45c. Antimony, Cookson's, 8c to 8⅛c; Hallett's, 7¾c to 8c; ordinary, 7¼c to 7½c.

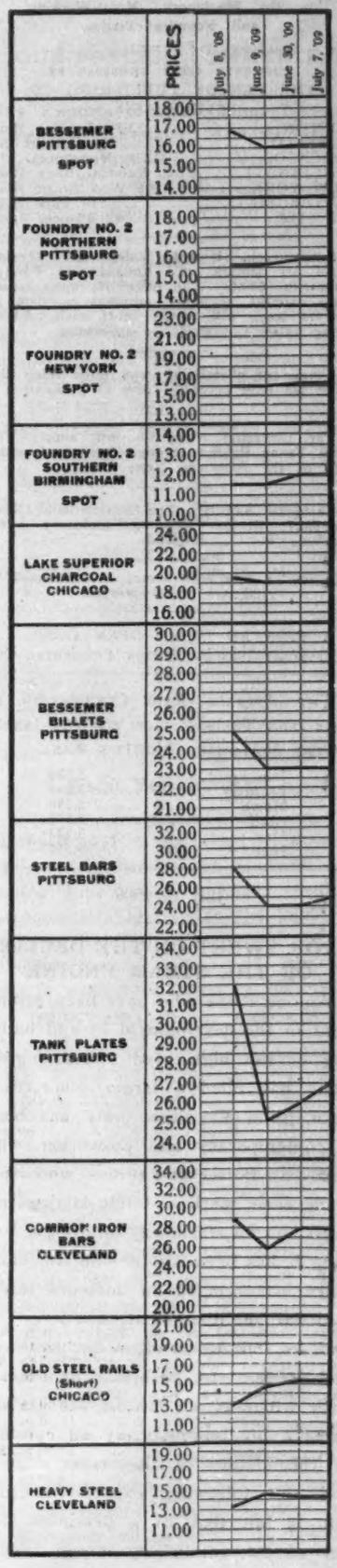
BRITISH IRON MARKET.

Prices Show Weakness and Conditions in General Not Satisfactory.

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., June 26.

The state of the pig iron trade and, indeed, of the iron and steel trades generally, furnishes a strange contrast to the activity reported in America, the reports of which have made a great impression on this side. Prices have shown weakness throughout the week, and have barely been maintained, but some reductions in the earlier part of the week have now been recovered, leaving the price of No. 3 Cleveland 48s 6d ($11.88). Cleveland warrants have slightly improved, being 1½d more than a week ago. Early shipment iron can be had at 46s 6d or a shilling below recent figures. The American reports have encouraged some optimists to predict that we shall soon be exporting pig iron to America, but of this there is no sign at present. Exports have failed to maintain the rate reached in April, although we are doing slightly increased trade with Canada and some insignificant shipments to the United States, but Germany and Scotland are taking very little iron.

PRICE CHART.



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THE AVERAGE PAID CIRCULATION OF THE IRON TRADE REVIEW FOR THE ISSUES OF THE FOLLOWING MONTHS WAS:

January	5,506
February	5,346
March	5,396
April	5,508
May	5,533
June	5,551

July 8, 1909.

PROF. SWEET ON THE DECLINE OF THE STEAM ENGINE.

Among those who have been prominent in the development of and building of the high-speed steam engine, none has filled a larger place than Prof. John E. Sweet. He has been a contemporary and co-worker with Chas. T. Porter and others who have made their mark and left lasting impressions on steam engine design. For long it has been his to hold the undivided attention of an audience international in its extent whenever he chooses to speak, and no one has ever had reason to feel disappointment with whatever he has to say. Prof. Sweet's life is practically an epitome of the history of the steam engine, and the following expression from him is not that of a pessimist nor yet of an enthusiast, though many of us would be willing to have the inevitable postponed merely to concede the dearly-loved professor the privilege and pleasure of rejuvenated enthusiasm. It is rather the logical conclusion of the careful, experienced and well equipped observer whose range of vision of past and future is beyond that of most men. In the course of an address on the development of the high speed steam engine, he said:

"It is for us, whose shadows are growing fainter and fainter, to anticipate what is to be the final outcome of our fighting this battle for the high-speed engine. Grass grows up and dies down; trees grow and die; dogs grow and die; and man suffers the same fate. Countries spring up, and flourish, and fade away; and astronomers tell us that the moon is dead, and that there are dead stars. Each and every one of the old slide-valve engines has had its day; a thousand rotary engines have died 'a-borning,' and the glory of the Corliss engine is waning.

"The high-speed and gas engines started together. The gas engine has matured much more slowly, and is about to have its innings. The high-speed engine is changing its coat, and must share the fate of everything else. It has served its purpose, proved its right to existence, been useful, and if it goes down with the Corliss engine it will die in good company."

Although the high-speed engine has been Prof. Sweet's life work, yet we do not blieve that in thus expressing himself he even felt a twinge of regret. Rather as an earnest and progressive engineer we think he feels pleasure in that he has lived to see what he has seen and to hope that he may be spared to see an even fuller development of the gas engine, a hope in which the whole engineering world will join.

THE CHANGING FORMS OF IRON AND STEEL.

The strong tendency to substitute steel for cast iron wheels in both steam and electric railway service illustrates distinctly the constant tendency to change the character of iron or steel for uses already well known. These shifts are going on continuously. The city of Baltimore has just let a contract for steel pipe for its new high pressure fire system, although cast iron pipe has heretofore been used almost exclusively. In so common a thing as a door hinge there has been the change from cast iron to rolled steel. In rails the change has begun. It is years ago that special steel began to be adopted in frog and crossing work, but it is only of late that railroad engineers have found it desirable to use rails of special quality in long stretches of track where the traffic is particularly heavy. The time was when the duty was light on main line rails, and steel of special durability was regarded as desirable only at points of special track construction. When the destructive tendency becomes great enough, it pays to buy special steel even at greatly increased first cost, for the reason that with a short life the replacement cost is heavy and interest cost is proportionately less important. Thus it is a change in the duty the rail must perform that has been chiefly instrumental in bringing about the rail of special quality. The improvements in manufacturing processes are being made largely because the demand is arising for the product.

The steel wheel promises such durability as compared with the cast iron wheel that it appears strange, at first glance, that it was not exploited sooner. It has been estimated, for instance, that the steel wheel, with the re-turnings which it permits, may show a life of 360,000 miles, against the 40,000 miles usually credited to the cast iron wheel. It must be remembered, however, that a mere comparison of first cost does not exactly represent the difference in economy. At 8,000 miles per year for a freight car, the 40,000-mile cast iron wheel would last five years while the 360,000-mile steel wheel would last 45 years, and the difference in interest cost must be figured as well as the difference in replacement cost. The saving, however, is obvious and there is the advantage which in some uses is more impor-

tant than that of mere cost, the advantage of safety.

The general introduction of the steel wheel will affect in a remarkable way the flow of iron, in its generic sense, through consumption. The iron in the cast iron wheel passes through a remelting every few years, the annual movement running into hundreds of thousands of tons. If the steel wheel shows the life expected, the material will hardly pass through the remelting stage once in a generation. Cars once equipped will keep their wheels, except for the re-turning, which may occur twice during the life.

APPRAISEMENT OF COKE PROPERTIES PRACTICALLY FINISHED.

The appraisement of the different coke properties of independent companies in the Connellsville regions, upon which options have been given to the nominal promoters for the proposed merger of these interests, has been practically completed in all its details. At the present time the figures of valuation are being recapitulated in the office of John W. Boileau, Pittsburg, for presentation in concise form to the financial interests and the parties who are bending their efforts to bring about the combination. With the exception of one or two plants upon which the data are not complete, the appraisement is now in finished form.

Mr. Boileau states that the appraisers have inspected and fixed a valuation upon the holdings of 60 separate interests, controlling a total of 79 plants. In this total are included several strictly acreage propositions, as for instance, the Green county coal land holdings of J. V. Thompson, of Uniontown, Pa., upon which comparatively little development work has been done, and it is estimated the options cover a total acreage of 38,000 of coking coal lands. This does not necessarily imply, however, that the merger, if completed, will be of such extent as some of the options may not be taken up before their expiration Oct. 1, since in some cases extremely high prices have been asked.

The promoters of the merger are quite sanguine in their statements of the probable successful termination of their efforts and express the assurance that a combination in some form will grow out of the work done. It is stated that some authentic announcement is likely to soon be made bearing upon the results of their efforts and as to the identity of the interests which are fathering the proposition. The declaration is made that while in some cases extremely high prices, ranging up to $5,000 an acre, have been asked by owners, the average price of the property considered, including the undeveloped and hence cheaper coking coal tracts in Green county and in other districts which are to be embraced, will not exceed $2,500 an acre, equipped for operation.

STRUCTURAL CONTRACTS

Figured on and Awarded During the Past Year.

(Special Telgram.)

New York, June 7.—Considerably over a million tons of structural work was bid on during the first half of 1909, fully 650,000 tons being let. The American Bridge Co. took 45 per cent of this total. During the week, about 25,000 tons was placed, 15,000 going to independent interests, including a 2,000-ton loft building to the Hinkle Iron Works, a 2,300-ton apartment to Ravitch Bros., a 500-ton planing mill at Huntington, to Riter-Conley and several smaller jobs. The terminal postoffice, 9,000 tons, has gone to the Pennsylvania Steel Co. The American Bridge Co. will secure the Millbrook building, 3,500 tons, and probably the Aultman store addition, 2,500.

Railroads are inquiring for a considerable additional tonnage. The Illinois Steel Co. reports 16,000 tons of rails sold.

CARNEGIE ACTIVITY INCREASING.

(Special Telegram.)

Pittsburg, July 7.—The Carnegie Steel Co. has ordered the North Sharon works to be placed in shape for operation, and it is expected to start this plant in a few weeks. With the North Sharon works active the company will have all its steel works and finishing mill capacity in action with the exception of Columbus. It has put on three additional open-hearth furnaces at the Ohio works, making 10 out of a total of 12 furnaces running, the other two not having been built. It is now working 80 to 85 per cent of its finishing capacity.

The Griffiths Charcoal Iron Mills, at Washington, Pa., have signed the independent sheet and tin plate scale with the Amalgamated, leaving but two union plants, the Youngstown Sheet & Tube Co. and the N. & G. Taylor Co., still unsigned. These are expected to be closed this week.

A local broker has taken 1,500 tons of basic for prompt and third quarter delivery at $15 valley.

The Pittsburg-Buffalo Co. has placed 1,600 steel mine cars with various manufacturing companies.

OUR FOREIGN COMMERCE.

May Exports Heaviest Since November, 1907—Equal to Best Annual Average—Fiscal Year Estimate.

While the tonnage of iron and steel exports in April were the largest since November, 1907, May follows with a still better record, showing a gain over April of 9,000 tons, or about 9 per cent. Each month since January has shown an increase, the January total of iron and steel exports being 70,089 tons, and the May total 109,977 tons.

The monthly movement of the tonnage lines since the beginning of 1907 is shown in the table below:

TOTAL IRON AND STEEL EXPORTS, GROSS TONS.

	1907.	1908.	1909.
January	102,630	74,353	70,089
February	64,728	81,773	84,860
March	112,787	96,681	94,522
April	132,792	93,285	100,903
May	91,543	64,020	109,977
June	92,996	69,779	.....
July	122,249	86,806	.....
August	118,792	87,244	.....
September	114,819	76,727	.....
October	123,170	85,668	.....
November	116,308	71,028	.....
December	86,019	77,656	.....
Total	1,301,979	964,266	460,351

Fiscal Year Estimate.

There remaining but one month of the fiscal year to be added to the total, an approximation can be made. Assuming June exports to have been at the same rate as in May, the total for the year ended June 30 would exceed 1,050,000 tons. This would compare with previous fiscal years as follows:

IRON AND STEEL EXPORTS.

Year ended June 30.	Gross tons.
1902	495,661
1903	302,492
1904	676,590
1905	1,123,580
1906	1,331,323
1907	1,229,245
1908	1,161,270
1909	1,050,000*

*Estimated.

The Irondale Steel Co., Seattle and Irondale, Wash., has offered 2,500 shares of its preferred stock for sale at par. The stock is being sold through the First National bank, the Dexter & Horton National bank and the Moore Investment Co., of Seattle.

John Sargeant, president of the Domhoff & Joyce Co., of Cincinnati, has sailed for England to visit his aged mother whose health is failing.

JUNE ORE MOVEMENT

Shows How a Large Tonnage Can be Handled Even in Strike Times.

That the best laid plans of mice and men gang aft agley is nowhere better exemplified than in the trade of the great lakes. The conjunction of two holidays which sometimes occurs causes dock operators and vessel owners to maneuver elaborately to avoid delays and, as ore is now moving freely, dispatch at the docks has become important. As many vessels were scheduled for Lake Erie ports and were due to arrive on Saturday, the Pittsburg Steamship Co. diverted a number of its carriers to Lake Michigan to secure dispatch. The movement was defeated, however, by violent weather which made it impossible for the vessels to get into the port of Gary. The result is that vessels are bunched on both lakes and normal conditions will not be restored until the latter part of the week.

The figures for the June movement of ore show with what ease the ore trade of the lakes is handled in spite of strikes and other impediments. It also proves pretty conclusively that some of the smaller steel freighters will have to seek other employment. There is no room for them in the ore trade. The vessels moved 5,393,255 tons in June with probably not more than 60 per cent of the fleet in commission. To July 1 the fleet has moved 8,702,323 tons. While this is an increase of 5,831,326 tons over the corresponding period last year it is a decrease of 3,983,307 tons when compared with the corresponding period for 1907. However everyone expects an easy movement from now on and it will be no trouble whatever for the vessels to overcome the handicap of a bad start. Following are the ore figures:

	June, 1907.	June, 1908.	June, 1909.
Escanaba	809,876	254,496	747,377
Marquette	392.186	119,014	287,127
Ashland	554,168	250,449	371,169
Superior	1,217,729	345,845	856,062
Duluth	2,156,216	1,078,118	1,968,800
Two Harbors...	1,303,194	537,760	1,162,720
Total	6,433,369	2,585,682	5,393,255
	To July 1, 1907.	To July 1, 1908.	To July 1, 1909.
Escanaba	1,824,215	260,741	1,132,233
Marquette	769,059	119,014	420,224
Ashland	1,049,357	271,577	612,024
Superior	2,318,911	478,633	1,464,577
Duluth	4,094,046	1,164,809	3,184,725
Two Harbors...	2,630,036	566,193	1,888,540
Total	12,685,630	2,870,997	8,702,323

Increase of 1909 over 1908, 5,831,326.

There is little to be said of the general situation except that trade conditions are visibly improving and that the strike of the engineers is proving no obstacle to the operation of the vessels. There is no trouble in getting an engineer when the vessel itself finds an opening for business.

THE MILLIKEN REORGANIZATION.

Under date of July 2, announcement has been made of a plan and agreement for the readjustment of the debt of Milliken Bros., Inc., New York City, as formulated by a creditors' committee consisting of Gates W. McGarrah, chairman, Arthur A. Fowler, John Hubbard, Gilbert G. Thorne and Edward Wallace. The plan contemplates taking the company out of the hands of the receivers and operating only the fabricating plant, which is the department so long successfully conducted by the old firm of Milliken Bros. and which is the only department which has been operated by the receivers. The readjustment plan proposes (a) to allow the present first mortgage debt to remain; (b) to issue to holders of claims against the company, upon the plan becoming operative, 10-year registered promissory notes or bonds, bearing interest up to 5 per cent, if earned; (c) to issue to holders of preferred and common stock, voting trust certificates under a voting trust agreement to run five years, with seven voting trustees as follows: William Nelson Cromwell, Arthur A. Fowler, Robert C. Lewis, Gates W. McGarrah, Gilbert G. Thorne, Edward C. Wallace and Harley P. Wilson. The total liabilities are given at $12,451,854.45 and the assets at $7,659,394.45.

PERSONAL.

W. H. MacMahon, a chemist of the Oliver Mining Co., at Virginia, Minn., has accepted a similar position with the Republic Iron & Steel Co., and is stationed at the Kinney mine, near Buhl.

A. Bradshaw Holmes, secretary and treasurer of The Independent Pneumatic Tool Co., and Aurora Automatic Machinery Co., Chicago, died June 30, from injuries sustained from accidentally falling from the piazza of his hotel. His age was 31 years and he was unmarried. Mr. Holmes was well known in the pneumatic tool business, having been connected with the Standard Pneumatic Tool Co. and the Rand Drill Co. for a number of years prior to his connection with the Independent Pneumatic Tool Co., of which corporation he was secretary and treasurer since its organization. He was a man of exceptional business ability.

C. E. Stewart, who has been in charge of the Southern Steel Co.'s plant at Gadsden, Ala., while it has been closed down, will be made assistant superintendent when the works resume. Joseph A. Durfree, formerly with the Tennessee Coal & Iron Co., has been named superintendent, and is now at work making an examination of the properties to decide upon needed repairs.

Eliot A. Kebler, sales manager of Matthew Addy & Co., Cincinnati, has accepted the position of resident agent at Pittsburg of M. A. Hanna & Co., Cleveland, who will handle all products of the United Iron & Steel Co. after July 20. Its properties include the Cherry Valley furnace at Leetonia, O., and Fannie furnace at West Middlesex, with a rated combined capacity of 210,000 tons annually.

Joseph W. Marsh, formerly vice president and general manager of the Standard Underground Cable Co., Pittsburg, has been elected president succeeding the late Mark W. Watson. W. A. Conner, general superintendent of the manufacturing department, has been made first vice president in addition to his former office and P. H. W. Smith, general sales manager, has received the additional title of second vice president. Frank A. Rinehart, secretary and treasurer of the company, has been elected to the board of directors.

OBITUARY.

George M. Vogel, secretary and treasurer of the Gendron Iron Wheel Co., Toledo, died in that city June 27, aged 47 years.

Charles W. Cathcart, for 10 years Cleveland representative of the Hess Spring & Axle Co., Cincinnati, died unexpectedly at the home of his sister in Springfield, O.

Mark Bird, for many years connected with the Bay View (Milwaukee) plant of the Illinois Steel Co., part of the time as superintendent, died in Milwaukee last week.

Albert Paulding Brayton, president and founder of the Pelton Water Wheel Co., San Francisco and New York, died at his home in Oakland, Cal., on June 25, aged 82 years. For many years he was a member of the firm of Rankin, Brayton & Co., which operated the Pacific Iron Works.

The National Tube Co. has blown in the last of its Lorain, O., group of furnaces which has been out for repairs and now has a total capacity of 11 staeks smelting iron. The company is also running its pipe furnaces full.

OPEN SHOP STRIKE

Keeps Mills in Idleness—Non-Union Plants Being Started.

Fourteen union tin plate and sheet plants of the American Sheet & Tin Plate Co. continue to be tied up by the strike declared July 1 by the Amalgamated Association of Iron, Steel and Tin Workers against the open shop order of the company. The men at the Guernsey sheet plant at Cambridge, O., have not joined in the movement and to date the strike has forced into idleness practically all the 131 operating union tin plate mills and 27 of the 38 active union sheet mills, the 11 mills at the Guernsey plant as yet having not been affected. Some of the mills at the Ellwood, Ind., tin plant are working on short crews. At the time of the strike the American Sheet & Tin Plate Co. was operating 202 union and non-union tin plate mills out of a total of 242 tin plate mills and 141 union and non-union sheet mills out of a total of 186 sheet mills. The company is getting its Demmler, Monongahela and other non-union tin mills, which have been idle, in shape for operation.

When the Amalgamated Association yearly signed the wage scales with the American Sheet & Tin Plate Co. it made these to apply only to the 15 union plants and made no efforts to extend the union agreement to the other non-union plants of the company. This situation has been changed by the strike order and the organization of the men is planning an attempt at unionizing additional plants which had formerly been run as open shops.

Tin House Men Working.

The union tin house employes of the American Sheet & Tin Plate Co. who are members of the Tin Plate Workers' Protective Association, a distinct organization from the Amalgamated, will not be affected by the open shop order of the company until July 15, when their annual wage agreement will expire. The tin house men are now working in the struck plants and if they strike, it will not be until the present scales are no longer effective, which will be July 15.

The independent sheet and tin plate interests by signing the new agreement with the Amalgamated for the year ending July 1, 1910, have fortified themselves against any union labor disturbances arising from the present strike. At the conference at Pittsburg, June 30, when the new agreement was accepted, the following companies signed the scales: American Rolling Mill Co., Middletown, O.; Carnahan Tin Plate & Sheet Co., Canton, O.; National Enameling & Stamping Co., St. Louis; Newport Rolling Mill Co., Newport, Ky.; Pope Tin Plate Co., Wheeling, W. Va.; Atlanta Tin Plate & Sheet Co., Atlanta, Ind.; Follansbee Bros. Co., Follansbee, W. Va.; Empire Iron & Steel Co., Niles, O.; Thomas Steel Co., Niles, O.; Zug Iron & Steel Co., Pittsburg, and the Youngstown Iron & Steel Roofing Co., Youngstown, O. The Whittaker-Glessner Co., Wheeling, W. Va., later signed the scale, but the Youngstown Sheet & Tube Co., N. & G. Taylor Co., Cumberland, Md., and the Griffith Charcoal Iron Mills, Washinstown, Pa., which have been union plants, have not done so. The new agreement with the independents is identical with that which was in force during the year ending July 1, 1909.

New Continuous Agreement.

In the new bar iron scales recently adopted by the Western Bar Iron Association and the Amalgamated Association, a continuous working agreement is included which permits the mills to continue operations until Aug. 1, 1910, while the new scale is under negotiation to supplant the one expiring July 1, 1910. This is an extension of a month's time for conferences without affecting the activities of the mills. No conciliation is provided, however, in the event that an adjustment of the scales has not been reached by Aug. 1. Previously the annual agreement arranged for continuous working of the mills in the event of a controversy while the dispute was submitted to a board of arbitrators, but this clause was abrogated last March by both mills and the men in the manner stipulated in the agreement.

The Amalgamated Association has notified the Republic Iron & Steel Co. that it will not treat with it upon the company's proposition to eliminate its Brown-Bonnell and Sylvan plants upon consideration in conferring upon the annual bar iron scale. The Sylvan plant is a merchant mill rolling steel exclusively and the company is also putting the Brown-Bonnell works upon a steel basis. It wishes to run these two plants as open shops. All the Republic plants are idle, having closed the past week for annual inventory taking.

Baldwin Locomotive Officers.—Under date of July 1, the Baldwin Locomotive Works, Philadelphia, a corporation organized under the laws of Pennsylvania, announces its purchase of the entire property, business and good will of the firm of Burnham, Williams & Co., assuming all its assets and liabilities. The firm has been dissolved by mutual consent. Officers of the new company are: John H. Converse, president; William L. Austin, vice president and engineer; Alba B. Johnson, vice president and treasurer; Samuel M. Vauclain, general superintendent; and William De Kraft, secretary and assistant treasurer.

RECENT PIPE LETTING.

The Glamorgan Pipe & Foundry Co., of Lynchburg, Va., was the lowest bidder for 4,000 tons of cast iron pipe which will be used in the extension of the water mains of Washington, D. C. The bid of the Glamorgan company was as follows: 3-inch pipe, $29.90 per gross ton; 4-inch, $25.42; 6-inch, $24.98; 8-inch, $24.57; 12-inch and 20-inch pipe, of different thicknesses, $24.02.

The bids of the other competitors were: Lynchburg Foundry Co.—3-inch pipe, $29.86 per gross ton; 4-inch, $25.86; 6-inch, 8-inch, 12-inch and 20-inch, of different thicknesses, $24.86. United States Cast Iron Pipe & Foundry Co.—3-inch pipe, $33.60 per gross ton; 4-inch, $29; 6-inch, $26.77; 8-inch, 12-inch and 20-inch, of several thicknesses, $25.65. Camden Iron Works—3-inch pipe, $40 per gross ton; 4-inch, $28.50; 6-inch, 8-inch and 12-inch, $26.25; 20-inch, of several thicknesses, $25.50. Standard Cast Iron Pipe & Foundry Co.—3-inch pipe, $33.82 per gross ton; 4-inch, 6-inch, 8-inch, 12-inch and 20-inch, $27.10.

WILL GO TO ENGLAND.

H. deB. Parsons, a member of the American Society of Mechanical Engineers, is on his way to England to convey personally to the Institution of Mechanical Engineers of Great Britain the acceptance of the latter's invitation to hold a joint meeting in that country during the last week in July, 1910. The invitation was recently extended personally by Sir Robert A. Hadfield, who is a member of the British institution's council, as well as past president of the Iron and Steel Institute. Mr. Parsons will attend the institution's meetings at Liverpool late this month, when a decision will be reached as to the city in which the joint meeting will be held.

One Management.—Announcement is made by President W. A. Moore of the Bellefonte Furnace Co., Bellefonte, Pa., that the Bellefonte company and the Nittany Iron Co., also operating a blast furnace at Bellefonte, are under the one management with offices in the same building at Bellefonte.

STEEL MAKING IRONS INCREASE

An increase in the total production of pig iron was noted for June of 63,172 tons over the production of May, although June had one less working day than May. June showed a total production of 1,929,929 tons, with a daily average production of 64,331. Compared with the first half of 1908 and 1907, the half year ending June 30, 1909, showed a total production of 10,820,059, an increase over the first half of 1908 of 4,030,596, or 59 per cent; it also showed a decrease of 2,393,645, or 18 per cent less than the first half of 1907. The June production showed an increase of 63,172 tons over the total production in May, which had one working day more than the month of June. The merchant iron production was 558,537, and the non-merchant or steel working products were 1,355,257 tons. The total production of spiegel and ferro in June was 16,135 tons, a falling off of 7,478 tons compared with May.

MONTHLY PRODUCTION.

	1909.	1908.	1907.
January	1,787,473	1,043,374	2,194,801
February	1,682,470	1,086,809	2,047,036
March	1,822,024	1,229,856	2,216,709
April	1,731,406	1,155,122	2,226,708
May	1,866,757	1,168,002	2,291,030
June	1,929,929	1,106,300	2,237,420
July		1,228,604	2,253,243
August		1,366,019	2,243,656
September		1,416,252	2,174,148
October		1,573,824	2,359,690
November		1,582,314	1,820,558
December		1,723,664	1,234,733
Total	10,820,059	15,680,140	25,299,732

The total production of merchant iron decreased 47,912 tons, while the total production of non-merchant iron increased 118,562 tons. The daily average production for June showed a gain of 6.8 per cent over the daily average of May. June's percentage of total possible output for the month was 57.9 per cent, the heaviest percentage for the year, surpassing even the banner month of 1909, which was February, with 57.3 per cent.

AVERAGE DAILY PRODUCTION.

	1909.	1908.
January	57,654	34,316
February	60,051	37,476
March	58,775	39,672
April	57,788	38,504
May	60,218	37,677
June	64,331	36,876
July		39,632
August		44,065
September		47,208
October		50,764
November		52,744
December		55,602

The average daily furnace capacity in blast on the last day of June was 65,238.7 tons, compared with 61,336.4 tons in May, and 57.859.2 tons in April. This shows a gain of 3,902.3 tons in June over May, and a total of 7,379.5 tons over the average daily furnace capacity in April.

A total of 14 stacks was blown in during June, and 10 stacks were blown out, making a net gain of four active stacks in favor of June. Of these, nine non-merchant or steel making stacks were blown in, and six blown out; five merchant stacks were blown in and six blown out.

Aside from Alabama, all states and groups of states showed increases in production, except the normal decreases in some states with the same number of stacks blowing, due largely to the fact that June had one less working day than May.

BLAST FURNACE NOTES.

Clifton No. 1, of the Alabama Consolidated Coal & Iron Co., was out eight days in June for light repairs.

No. 2 Vanderbilt stack of the Birmingham Coal & Iron Co. was blown out June 20. No. 1 stack was blown in June 24.

The Central Iron & Coal Co., which blew out its Alabama stack May 17, expects to have the stack relined and ready for operating by July 25.

The Woodstock, Ala., stack of the Woodstock Iron & Steel Corporation, which had been blowing the early part of the year, was blown out for relining June 1, and will blow in about July 5.

The Thomas Furnace Co. blew out its Thomas, Wis., stack June 30 for repairs. It expects to be operating again Aug. 1. It made a total of 800 casts of Bessemer pig iron with a less percentage than 5 per cent in phosphorus, which is believed to be a record run in Bessemer iron.

Gary stack No. 4, the fourth to be operated by the Indiana Steel Co., was blown in June 11.

South Works stack No. 8, of the Illinois Steel Co., was lighted June 2.

Bellefonte Iron Works, Ironton, O., banked its Bellefonte stack June 17 indefinitely.

Bessie Ferro-Silicon Iron Co., Columbus, O., blew out its Bessie stack June 1 for repairs.

The Carnegie Steel Co. is blowing 46 out of a total of 59 blast furnaces.

The Hanging Rock Iron Co., Hanging Rock, O., banked its Hamilton stack June 17 for an indefinite period.

The Kelly Nail & Iron Co. blew out its Sarah stack about June 18.

Stack No. 3 of the Monongahela, Pa., furnace of the National Tube Co. was blown in June 17.

Alice stack, at Sharon, Pa., of the Youngstown Sheet & Tube Co., was blown in June 30.

Sheridan, Pa., stack of the Berkshire Iron Works, was blown out June 10 for relining and general repairs.

The Sharpsville Furnace Co. announces that it intends to blow in the Sharpsville, Pa., stack early in July.

The Standard Iron Co., Goodrich, Tenn., will blow in its Goodrich stack early in July.

JUNE FURNACE REPORT.

STATES.	NO. OF STACKS.	NO. IN BLAST ON LAST DAY OF MONTH. JUNE.	NO. IN BLAST ON LAST DAY OF MONTH. MAY.	PERCENTAGE OF TOTAL POSSIBLE OUTPUT MADE.	AV. DAILY CAPACITY IN BLAST LAST DAY OF MONTH.	ACTUAL TONNAGE MAKE. MERCHANT.	ACTUAL TONNAGE MAKE. NON-MERCHANT.	TOTALS. JUNE.	TOTALS. MAY.
Pennsylvania	155	102	99	64.9	28,427.4	164,634	668,120	832,754	819,500
Ohio	66	43	46	63.7	14,572.8	111,613	313,043	424,656	391,561
Alabama	46	18	19	39.9	3,245.4	99,355	———	99,355	113,524
Virginia	24	9	9	36.8	983.7	28,973	———	28,973	31,758
New York	25	15	13	60.0	14,042.5	57,606	63,687	121,293	109,422
New Jersey	9	3	3	33.3	619.5	18,590	———	18,590	19,555
Illinois	25	19	18	75.7	6,931.2	16,397	186,300	202,697	197,225
Tennessee	18	8	7						
West Virginia	4	3	3	42.1	1,617.2	23,115	21,931	45,046	36,431
Kentucky	7	2	2						
Maryland	4	2	2						
Wisconsin	6	5	5						
Colorado	6	3	3	69.7	4,251.0	22,236	102,176	124,412	107,770
Indiana	5	5	4						
Georgia	2	0	0						
Texas	3	0	0						
Minnesota	1	1	1	33.3	533.7	16,018	———	16,018	16,398
Michigan	2	1	1						
Missouri	1	1	1						
Spiegel—All states								6,604	13,617
Ferro—All states								9,531	9,996
Total	408	240	236	57.9	65,238.7	558,537	1,355,257	1,929,929	1,866,757

UNDUE ATTENTION PAID TO SMALL FLAWS IN STEEL

AND DISEASES OF MATERIAL EXAGGERATED BY EXPERTS

Asserted at Meeting of American Society for Testing Materials—Defects in Open Hearth Rails Considered—Results of Tests of Bethlehem and Standard Beams Reported Upon

That undue importance is being attached to what are really inconsequential flaws in steel, and that the experts who study the diseases of this material are apt to exaggerate conditions existing in average steel, were the sentiments expressed by several noted engineers at the twelfth annual meeting of the American Society for Testing Materials, held at the Hotel Traymore, Atlantic City, June 29 to July 3. The ability of the metallographist to diagnose all of the ailments of defective steel was also questioned and it was asserted that some investigators can find almost any disease they are looking for from the examination of micrographs of steel sections. While the manganese sulphide theory was again advanced and credited as the primary cause of frequent rail breakages, nevertheless doubt was expressed as to its importance and the opinion was ventured that only a comparatively small percentage of failures is due to this phenomenon.

Dr. C. B. Dudley, chemist of the Pennsylvania railroad, and president of the society, stated that he could not agree with either side, as there are some unsolved problems that require careful investigation. He believed that steel found to contain manganese sulphide and silicate of manganese would break in service and he was further of the opinion that the steel works could make better steel if they allowed a longer time to elapse from the addition of the spiegel-eisen and ferromanganese to the casting into ingots. He added that the electric furnace might do something in this direction, but questioned wether it is worth while to make better steel than is now being produced. Continuing, he said that great surprise was expressed throughout the country regarding a statement he made, that if rails were properly supported, he could send a train in safety from New York to Chicago on cast iron rails. "The question is," he added, "where is the balance between spending money on track for proper support, draining sub-grades, etc., and putting money into securing better rails?" Data are now being gathered by the Pennsylvania railroad to determine whether it is most advisable to make a larger outlay for maintenance or to pay more money for higher grade rails. Dr. Dudley stated that it is a well-known fact that even inferior steel, properly supported in track, will do the work required of it. If to provide such proper support is more expensive than a superior quality of rails, then the railroads will put their money into rails. W. C. Cushing, chief engineer, maintenance of way, Southwest system, Pennsylvania lines, in reply to a query as to the frequency of crescent-shaped breaks of rails on bridges where the track is well supported, replied that there are very few.

That there is a growing recognition of the excellent work that is being done by this organization was reflected by the number of requests received for the compilation of standard specifications for various materials. Nor were the number of specifications reported and favorably acted upon as great at previous gatherings as during this meeting, and the executive committee was empowered to appoint committees to prepare standard specifications for gunpowder and other explosives, tests of insulating materials and to co-operate with the United States bureaus of standards in connection with the collection of material for "standard samples."

OPENING SESSION.

After the annual report of the executive committee was submitted at the opening session on Tuesday afternoon, proposed Standard Specifications for Hard-Drawn Copper Wire were presented and referred, without change, for letter ballot to the members of the society.

C. E. Skinner next read a paper entitled, "The Desirability of Standardizing the Testing of Insulating and Other Materials," and in conclusion said:

"It would seem to me to be preeminently the function of this society, and the privilege of its members, to co-operate through the society in such a way as to bring about the earliest possible standardization of tests and testing methods by which we measure the essential qualities of the materials of engineering. As time goes on it will be increasingly difficult and expensive to bring about such standardization."

A committee for carrying on this work is now being formed with instructions to report at the next annual convention.

Discussion Concerning Coal.

An interesting paper that provoked considerable discussion, prepared by D. T. Randall and Perry Barker, and read by the former, on "The Effect of the Various Constituents of Coal on the Efficiency and Capacity of Boiler Furnaces," was next presented. The size of the coal, it was stated, affected results to a considerable extent. Those which coke readily do not show a very great loss when used in a fine or granulated form, as they form a fuel bed through which the air passes readily. Laboratory tests of coal were preferred to boiler tests on account of the frequent unfamiliarity of the firemen with the grade of coal they are using. A high percentage of moisture is not desirable, because it has a tendency to reduce the temperature, as it holds a large amount of heat in escaping from the stack. One speaker said that there is no particular advantage to be derived from introducing a steam jet into a furnace owing to the great amount of heat required to dissociate the steam into its elements. Another speaker stated that he had in mind two concerns, one using every precaution to keep its coal absolutely dry, while the other exposes it to the weather and saturates it with water before use. In the first instance, lump coal is used exclusively, while in the latter case only slack is consumed. The saturation of the fine coal, it was explained, resulted in holding it together on the fuel bed. It was also added that any poor coal can be successfully burned in a well designed boiler. In referring to coal specifications, Dr. C. B. Dudley said that the problem is an exceedingly complicated one, inasmuch as it is essential that the consumer gets what he pays for and that the producer gets ample remuneration for what he furnishes.

Fireproofing Materials.

The chairman of the Committee On Fireproofing Materials reported that

no changes were made in the specifications and these will be referred to the members of the society for letter ballot. In discussing fireproofing materials, Dr. C. B. Dudley said that the railroads dread nothing more than fire after a wreck. Steel passenger coaches are now being used by the Pennsylvania railroad on all trains passing through tunnels into New York City, approximately 150 having already been built. To ascertain the fire-resisting qualities of various woods treated differently with various pigments, and in one case covered with plush, an interesting series of experiments was recently conducted by the Pennsylvania Railroad Co. at Altoona. It was found that white zinc retarded fire more than any other material and that one fireproofing mixture made of phosphate and sulphate of ammonia, while retarding the fire for a time, developed poisonous fumes after the fire had gained headway that were as fatal as the fire itself.

TUESDAY EVENING.

A very interesting report on "Tests of Ingots and Derivative Shapes in Progress at Watertown Arsenal" was made at the second session, Tuesday evening, by James E. Howard. It was explained that these tests were being conducted to develop information as to the causes which detract from the soundness of structure, and to aid in attaining this end the material, from the ingot through the several reductions to the finished rails, is being examined. It was found that slag inclusions, which are globular in the ingot, are gradually extended as the metal is rolled down and it is believed that the starting places of streaks or hair-line cracks are at the ingot, where slag inclusions initially are found.

In conclusion, it was stated that the markings commonly brought out on the cross-sections of steel rails by etching are believed to be those which have their origin in the ingot, and that the state of the metal in the ingot, as regards presence of slag and zones differing in structure at this stage, carries through the several passes to the finished rail.

Blowholes in Ingots.

"The Closing Up of Blowholes in Steel Ingots" was the subject of an address delivered by H. M. Howe in which he sought to disprove the theory that the gases causing blowholes in steel are held in hermetically-sealed cavities, and that they therefore could not be eliminated. Three blanks or slabs were cut out of a steel ingot, having dimensions 9.75 x 12 x 45 inches, from a point near the top, at the middle, and near the bottom. These slabs were machined and the blowholes in the one taken from the upper part of the ingot were not nearly so numerous nor as large as those in the middle slab and that cut from the bottom. The cavities in the slab from the upper section were surrounded by a compact area of steel and they extended about the slab in a well defined zone, while the lower slab was fairly honeycombed. The rest of the ingot was then rolled into a plate, 50 inches wide, ½-inch thick, and 150 inches long. Sections were then cut out of the plate at points opposite those from which the slabs were removed from the ingot, and to ascertain the relative density of the material the specific gravity of each was determined. It was found that the specific gravity of the steel in the spongy part of the ingot was 6.58 and in the plate rolled from this spongy part, 7.8. The specific gravity of the steel in the compact portion of the ingot was 7.83, and in the plate rolled from this section, 7.9. This increase in specific gravity proved conclusively that the rolled material was denser than the steel in the ingot and therefore there must have been a closing up of the cavities. In the rolling of the plate, the blowholes must also have been spread out and from the size of the cavities in the ingot, it was estimated that they were reduced to approximately 0.01 inch in thickness, 1.3 inches in width, and 3.5 inches in length. It was also found that the specific gravity of the compact portion of the ingot and plate exceeded that of the porous portions by

	Ingot.	Plate.
Middle	10 per cent	0.2 per cent
Bottom	16 per cent	0.0 per cent

It was concluded that, if the blowholes continued in the rolled plate, a large part of the gases must have escaped and they could not, therefore, have been held in hermetically-sealed cavities. It was explained that gas passes out of iron with great ease. When wire is pickled, and without a great amount of heating, hydrogen passes out of the center without any pressure exerted on the outside. In closed soaking pits after the ingots are charged, it has also been found that the air is rapidly replaced by gases from the ingots.

If the blowholes are closed, the problem of welding is next presented, and the speaker was of the opinion that there were very good reasons to believe that the blowholes in rolled steel are welded together.

All Cavities Not Welded.

In the ensuing discussion it was stated that boiler plate, when subjected to a bending test and fractured, was rejected if it developed cavities more than ¼-inch in length and the speaker was of the opinion that present steel rolling processes do not weld all cavities.

The forging of crucible steel ingots to close up the blowholes was next referred to as being similar to the rolling process to obtain practically the same results. The maker of boiler plate, it was explained, could not take these precautions owing to the prohibitive cost of the operation. It was suggested, however, that a distinction should be made between the welding of blowholes and the occluded slag and scale that no amount of rolling could remove.

The forging of open-hearth ingots, to be used for tool steel, was successfully carried on by a firm with which another speaker was affiliated, for a considerable period, and it was found that the cavities were welded together with marked success. This material, for many purposes, served equally as well as crucible steel. It was explained that the ingots were heated to a high temperature, before forging, to weld the blowholes, and great care was exercised in this operation.

Further discussion developed the fact that the forging of crucible steel ingots is no longer practiced by most of the tool steel makers in this country and that they do not experience difficulties from blowholes, piping, etc. In the early days of the manufacture of Bessemer steel, the ingots were compressed by hydraulic power and many of the rails rolled from this material have been in service until recent years. When an eastern steel works began the manufacture of open-hearth steel many years ago, all of the ingots were forged before rolling under a 25-ton hammer and the finished product was entirely free from imperfections. When the hammer was replaced by a blooming mill, trouble was immediately experienced from the porosity of the steel.

Henry Fay and R. W. G. Wint then reported upon "Further Investigations of Broken Steel Rails." Their conclusions were reported in THE IRON TRADE REVIEW, July 1.

Defective Open-Hearth Rails.

"Investigations of Defective Open-Hearth Rails" were submitted by Robert Job, in part, as follows:

During the past few years the proportion of open-hearth rails rolled has increased rapidly owing to the fact

that by cutting down the phosphorus to a minimum a great increase in toughness results, rendering possible a much higher carbon content than is safe in a high phosphorus Bessemer rail, and hence a higher elastic limit, with increased hardness and capacity for wear.

With good mill practice very favorable service results may be obtained, and we have known of instances in which such rails have averaged only one-third the wear found with the usual Bessemer rails when laid in track end to end with the others and under exactly the same conditions of service.

As has been pointed out repeatedly, the name "open-hearth" is no talisman for production of rails certain to give good service, and it is well known that rails of this method of manufacture are subject to the same general defects which may be found in Bessemer rails, and hence require equal care during the process of manufacture.

In the study of causes of failure of rails, striking instances occasionally occur which are of especial interest in view of the results in service. An example of this type took place not long ago.

An open-hearth rail had broken in service into about 40 pieces, derailing a train, but fortunately causing no loss of life, and a critical examination was made to determine the exact cause of the failure. In the preliminary investigation we found that a blowhole began near the receiving end of the rail about one-half inch below the top of the head, parallel with the surface of the latter, and extended clear to the running-off end of the rail. Within a short distance from the start the unwelded seam spread from one side of the head to the other, with oxidized surfaces. In the unbroken rail, no defect could have been visible, and even after the fracture the only sign of defective condition upon the contour of the unbroken pieces was a faint line like a roll mark along the side of the head, generally covered with mill scale. When the fracture came, evidently the half-inch layer upon the top of the head cracked, throwing the end against the opposing wheels and thus causing the derailment, the remainder of the rail being ground into pieces by the force of the impact and the pounding of the wheels.

In order to study the condition of the steel a transverse section was cut at a point about 3 feet from the receiving end of the rail, and an analysis made of the borings taken with a 5/8-inch drill about one-half inch below the top of the web showed the following composition:

	Per cent.
Carbon	1.070
Phosphorus	0.031
Manganese	0.758
Sulphur	0.025

The heat average was about as follows:

	Per cent.
Carbon	0.75
Phosphorus	0.30
Manganese	0.76
Sulphur	0.05

In order to note the extent of segregation in the section, borings were taken with the 5/8-inch drill about one-half inch to the side of the center of the head at a distance of 1½ inches from the location of the first borings and the following composition was found:

	Per cent.
Carbon	0.918
Phosphorus	0.027

From the above it is clear that radical segregation of the ingot existed and accounted for a decided difference in the physical properties of the steel in closely adjacent places. The granular structure of the steel was about normal, showing that burning or overheating had not occurred.

As the next step in developing the physical character of the metal, we polished the surface of the section and found that the steel contained a large number of porous, spongy spots. The fracture was unquestionably caused by the large blowhole across the head, but even though this had not been present, short life would have been certain to result owing to the general condition of unsoundness, for the fact has been demonstrated so often that it has become an axiom that good service cannot be expected from an unsound rail.

So-Called "Soft Steel."

In many cases of unsoundness the general location and character of the defect are indicated by the service which is given and the manner in which the rail begins to fail. When great porosity exists or when much slag and other matter is present, slivering generally follows after a short life and the steel upon the outside edge of the head begins to flow, ultimately sloughs off, and is called "soft steel" by the trackmen, although this action gives no indication of the carbon content; it is simply a consequence of unsoundness. We have found that the service suffers severely when unsoundness exists near the upper portion of the head, and fracture may occur. When the same defects are somewhat below the surface, leaving a layer of sound steel a quarter of an inch or so in width, good service often results until the sound metal has worn away.

In the investigation of broken rails, a characteristic form is occasionally found. A sharp, pronounced cut appears upon the top of the head of the rail with a straight sheer cut extending into the steel an eighth of an inch or so, and then a smooth, split-off appearance extending well down toward the web. This condition has been caused by a blow from a sharp edge of a defective wheel, and we have known of instances in which scores of rails have been put out of commission, each with the distinctive mark, by a single defective wheel. The final fracture may not occur until the lapse of some little time after the damage has been done, but the plane is gradually extending from the original cut and on some sudden stress the rail is broken at the injured point.

In referring to the sulphur content in the segregated portion of the open-hearth rail reported upon by Mr. Job, which was only 0.025 per cent, one speaker said that this is undoubtedly the smallest percentage that is likely to be found in any rail and it was evident that the steel makers are getting down to almost impossible limits.

Slag Markings.

The conclusion of Henry Fay with reference to widely diffused slag markings on a micrograph of a defective rail were questioned, inasmuch as so large a percentage of slag in a single rail would easily be detected in weighing, as it would fall considerably short of the required weight. In mirror polishing, it was added, many pits cannot be explained and it was altogether possible that these pits, taken for slag, were merely marks of the file.

W. A. Bostwick, metallurgical engineer of the Carnegie Steel Co., Pittsburg, said that the company is manufacturing steel that is to machine readily that contains abnormally high percentages of sulphur and manganese. Yet, no manganese sulphide streaks have been found in any of this steel.

WEDNESDAY MORNING.

C. E. Munroe, Washington, D. C., recommended the adoption of standard specifications for gunpowder and other explosives. He explained that various grades of this material are sold under befuddling names and that there is a great need of standard specifications for the protection of both producer and consumer. The appointment of a committee to undertake this work was referred to the executive committee.

Standard Specifications.

The report of Committee A on Standard Specifications for Iron and Steel was next submitted and provides for standard specifications for structural steel for ships, structural steel for buildings, open-hearth boiler plate and rivet steel, steel splice bars, steel tires, Bessemer and open-hearth steel rails. These specifications, with the exception of open-hearth steel rails, were originally adopted in 1901 and have not been revised since that time. No changes in the specifications for wrought iron were recommended and the committee suggested the appointment of another committee to consider this subject, owing to the diversified products to be considered.

The proposed specifications for ships, buildings, open-hearth boiler plate and rivet steel, and steel tires, have been largely re-written. The proposed specifications for steel splice bars were changed only to the extent of omitting the previously prescribed limits of carbon and manganese, and only the previous limit of phosphorus was retained. Reference to the location of the test piece was changed from "the head of the splice bar" to "the splice bar."

The committee also recommended that the present standard specifications for structural steel for bridges be amended by lowering the allowable limit for phosphorus in acid open-hearth steel from 0.08 to 0.06 per cent.

The proposed specifications which will be referred to the members of the society for adoption by letter ballot are published in the supplement in this issue.

Fire Box Steel.

A plea for the reduction of the phosphorus and sulphur limits of fire box steel was made, and it was further suggested that rolling the plates crosswise as well as in the present direction might improve their quality. Several plate manufacturers were of the opinion that a reduction of only 0.005 per cent in both the sulphur and phosphorus content would have little effect upon the wearing qualities of this steel, and it was added that many evils can be overcome in the mechanical operation of manufacture without resorting to finely drawn differences in chemical specifications. The opinion was also expressed that there is undoubtedly a diffusion of sulphur in fire box steel in service from the coal and this raises the sulphur content beyond the percentage contained in the plate at the time of manufacture.

Dr. C. B. Dudley, in commenting upon the use of fire box steel, said that nowhere is steel subjected to such severe service as in locomotive fire boxes. He was not prepared to state whether a reduction in sulphur of only 0.005 per cent would overcome many of the present difficulties experienced. An analysis of fire box steel made in the early days of plate manufacture contained 0.14 per cent of phosphorus and notwithstanding this it gave very good service.

Coal Specifications.

J. A. Holmes, Technological Branch, United States Geological Survey, chairman of the committee on Standard Specifications for Coal, presented a progress report. The committee consists of 60 members and sub-committees have been named to prepare specifications for various classes of coal, such as steam, domestic, metallurgical, gas producer, etc.

Reporting the progress made in fuel investigation during the year ending June 30, 1909, by the United States Geological Survey, Mr. Holmes said that the fuel testing plant has been permanently located at Pittsburg and that many tests of various grades of coal from all sections of the country have been made. In conducting these tests little value is placed upon the sample unless its history is known and all of the coal tested is taken from the mines by the men connected with the testing plant. The use of low grade fuels in gas producers is one of the problems that is being investigated and coal containing from 40 to 44 per cent of ash has been successfully used in one type of producer.

Waste in Coal Mining.

Some difficulty was experienced in securing samples of low grade coal from the mines in the Pittsburg district and upon investigation it was found that only 3 feet of 9-foot veins are being mined, the remainder being permitted to remain in the ground. Samples of the so-called low-grade coal which was not removed from the mines, when tested proved to be as good as the best Illinois coal and is serviceable for burning under boilers and in gas producers. The waste in coal mining from leaving supposedly low-grade fuel in the ground was estimated at approximately 250,000,000 tons last year. A special study of coal for manufacturing illuminating gas is now being made and the heat producing values of petroleum, especially that secured from the western fields, is being ascertained. In conclusion, Mr. Holmes expressed the opinion that there must be a readjustment of the prices of coal to enable the producers to mine the low-grade fuel now left in the ground and, furthermore, methods of using this coal must be ascertained.

Low Grade Fuels in Europe.

Prof. R. H. Fernald briefly outlined the progress made in the use of low grade fuels in Europe. In England he found that nothing had been done along this line and one concern operating a large power plant at its own mines uses the best grade of coal mined in its gas producer plant. In Germany, on the contrary, mixtures made up from the culm pile, roofing slabs, washings and other refuse, containing 53 per cent of ash are being successfully used in gas producers in one plant, while another, using slabs containing 60 per cent of ash, not only uses the gas for generating steam, but is distributing it for lighting purposes in a neighboring town. In Sweden, peat is successfully used in gas producers, the plants in many cases being located at the peat bog. In this country he believed it perfectly feasible to locate the gas producer plants at the mines, where the low-grade fuel can be consumed without incurring additional transportation charges, and power can thence be distributed from these central stations.

WEDNESDAY EVENING.

The results of a series of tests of standard and Bethlehem I-beams and Bethlehem girders made by Prof. Edgar Marburg at the University of Pennsylvania and reported Wednesday evening, proved a surprise to many of the steel manufacturers in attendance and it was recommended, owing to the startling nature of some of the findings, that the investigation be further pursued on beams 15 inches and under, inasmuch as those tested ranged in size from 15 to 30 inches.

Bethlehem Sections.

The scope and purpose of the tests as well as the results and conclusions are given in part as follows:

The new Bethlehem special I beams and girder beams, rolled on the Grey universal beam mill, at the works of the Bethlehem Steel Co., South Bethlehem, Pa., differ in certain important particulars from the so-called "standard" beams. In the Grey mill the flanges and web of the beam are formed by the simultaneous operation of independent horizontal and vertical rolls, thus admitting of the effective rolling of the metal in the flanges as well as the web. This renders it possible to produce wider flanges than by beam mills of the ordinary type in which the linear speed of rolling at different points of the beam varies inversely with the distance from the center of the roll, resulting in a dragging action upon the flange metal, which becomes emphasized with increasing flange width. It is claimed that sections produced by the Grey process are also subjected to uniform reduction in rolling at all parts of the shape, resulting in greater uniformity in the physical properties of the material throughout the section, and in the avoidance of internal stresses, and that, in consequence, under nominally the same working stresses, they possess a larger safety margin than beams made by the usual method. It is further claimed that the webs of the standard beams are unnecessarily thick for economy, but that it is not practicable to reduce their thickness in the ordinary mill. Compared with the lightest standard beams of like depth, the lightest Bethlehem special I beams are designed so as to possess the same section moduli at weights uniformly 10 per cent less. This is effected by a material decrease of web section and a slight increase of flange section, the comparison for the lightest 24 and 15-inch beams being approximately as follows:

	24-in. beams.		15-in. beams.	
	Std. 80 lbs. sq. in.	Bethl. 72 lbs. sq. in.	Std. 42 lbs. sq. in.	Bethl. 38 lbs. sq. in.
Web section	10.9	8.1	5.5	3.8
Flange section....	12.4	13.1	7.0	7.4
Total	23.3	21.2	12.5	11.2

By adding one-sixth of the metal deducted from the web to each flange,

the section modulus would remain unchanged, provided the depth between centers of gravity of the flanges is unaffected. Since the flanges of the Bethlehem beams are wider and thinner, however, than those of the standard beams, the flange metal in the former is more favorably disposed; hence the increase of each flange area, for equal section modulus, will be slightly less than one-sixth the area taken from the web as seen from an analysis of the values in the above table. The slope of the flanges of the Bethlehem beams is one-fourth less than that of the standard beams, or 1 on 8 instead of 1 on 6.

The Bethlehem girder beams are so designed that the lightest section of a given depth up to 20 inches possesses just twice the section modulus of the lightest standard beam of corresponding depth, whereas the weight of the former averages about 12.5 per cent less than the double weight of the latter. The web thicknesses are practically identical, the difference lying chiefly in the greatly increased width and slightly increased thickness of the flanges.

The claims advanced in favor of the Bethlehem as compared with the standard beams, briefly summarized, are:

Claims Made.

1. That the material in the flanges receives more work in rolling and is, therefore, of better quality.
2. That the material throughout the section is more nearly uniform in quality.
3. That the beams are comparatively free from internal stresses.

If these claims are valid, it obviously follows that the Bethlehem beams are stronger for like section moduli, provided the relatively thin webs do not induce premature failure by buckling.

In view of the importance of the subject to the engineering profession, and the desirability of determining by actual tests the validity of the above claims, the writer proposed to the Bethlehem Steel Co. to conduct at the expense of that company, in the laboratories of the department of civil engineering, University of Pennsylvania, an extended series of comparative tests between Bethlehem and standard beams, reserving to himself only the right of publication. This proposal was accepted, and a program of tests was accordingly drawn up by the author in conference with George H. Blakely, structural engineer of the Bethlehem Steel Co. This program was regarded at the time as a preliminary one to be further elaborated, or modified, in the light of experience. In that expectation the writer was disappointed, since even the material for the completion of the program originally agreed upon had not been wholly supplied when the tests came to an unexpected termination last December. If the results of these tests, which are all embodied in this paper, point conclusively to one thing, it is the importance of continuing these investigations on greatly extended lines.

Claim Not Substantiated.

The claim of superior uniformity in the physical properties of the material throughout the section, advanced in favor of the Bethlehem beams, is not substantiated by these tests. Of the six Bethlehem beams, in which the material was subjected to tensile tests, the uniformity with respect to the elastic limit was good in one case, fair in another, and bad in the remaining four. In the last four cases the elastic limit of the web exceeded that of the root by 195, 126, 99 and 74 per cent, respectively. The writer regrets that he was not afforded the desired opportunity of making numerous additional tests of this character. In the light of these results it would seem that the material in the vicinity of the root received insufficient work, or was finished at too high a temperature, or both, in the Bethlehem as well as the standard beams.

Some Deductions.

Regarding the fiber stresses at the elastic limit the following deductions were made:

1. That the elastic limit of the standard beams is very nearly constant, the average value lying slightly above 20,000 pounds.
2. That the elastic limit of the Bethlehem special I-beams is much lower for quarter-point than for central loading, and that this is true also, though in a less degree, of the girder beams. A partial explanation may, perhaps, be found in the fact that with the former loading, the maximum fiber stress is developed throughout the middle half of the beam instead of at the central section only; although this applies equally to the standard beams, which exhibit no such difference in their behavior.
3. That the elastic limit of the 15-inch Bethlehem beams is much higher than that of the 15-inch standard beams, under central loading, and slightly higher under quarter-point loading.
4. That the elastic limit of the Bethlehem beams declines very rapidly for the larger sections, reaching finally the remarkably low value of 10,800 pounds for the 30-inch girder beams, the values for the other two beams of that set being only slightly higher. The writer will not hazard an explanation as to the cause of these remarkably low values of the elastic limit; but he desires to express his conviction that if the beams tested are fairly representative samples, the use of a working fiber stress of 16,000 pounds per square inch, as usually recommended for buildings, is indefensible. It is essential, in his judgment, that the investigation of this phase of the subject should be greatly extended.

Manner of Failure.

The standard beams failed in every instance by what is described as "lateral deflection of top flange," and the Bethlehem special I beams by what is designated "twist of web." Manifestly any lateral movement of the flange is accompanied by a like movement of the web. The distinction in the two forms of designation is made, however, because in the case of the standard beam the initial cause of failure seemed to be the lateral weakness of the compression flange, that is to say, while the flange would deflect laterally near the center, the verticality of the web at the ends would be well maintained, unless the bending of the beams was continued, under rapidly decreasing loading, far beyond the point at which the load had reached its maximum value. The failure of the Bethlehem special I beams was, on the contrary, generally speaking, marked by a sudden and considerable twisting of the web—usually in opposite directions at opposite ends, the beam as a whole assuming the form of a very flat letter S—the flanges remaining comparatively straight.

The characteristic failure of the 15 and 24-inch Bethlehem girder beams, under quarter-point loading, was by the lateral deflection of the upper flange, in a manner very similar to that of the standard beams. Owing to the greater width of flange in these beams, this deflection, once begun, did not increase as rapidly as in the case of standard beams. The 30-inch Bethlehem girder beams failed by the twisting of the web. The 15-inch girder beams, centrally loaded, failed, on the contrary, by the wavy buckling of the outstanding edges, vertically, in the vicinity of the center, the metal being apparently too thin to bring about failure through the lateral deflection of the compression flange. When this form of failure began to manifest itself, there was no evidence of any lateral deflection of the flange as a whole.

In general it may be said that there was in no instance any evidence of the buckling of the web in detail vertically, not even at the points of loading and support. The web in twisting assumed the curvature of a warped surface, that is to say, its originally vertical elements became inclined, but remained straight, or grew very slightly curved, as was apparent on the application of a steel straight-edge to the webs after the beams had failed.

Conclusion.

The number of tests are not sufficient to warrant definite conclusions. They do point out the need, however, of greatly extended investigations along these and similar lines, with a view of throwing more light on the following points in particular:

1. The low elastic limit of the metal near the root of the flange: its cause and prevention.
2. The low elastic limits in bending for the deeper beams: the cause and prevention, unless it can be proven conclusively that the values obtained in the present series are abnormal.
3. The effect, both on the elastic limit in bending and modulus of rupture, of variations in the supports and lateral restraint at the ends and intermediate points.
4. Extensive tests on the crippling strength of thin webs.
5. An experimental inquiry relative to the existence and magnitude of internal stresses, and how these are affected by different methods of rolling, finishing-temperature, etc.

Process of Rolling.

In the ensuing discussion attention was directed to the process of rolling,

the web being drawn very rapidly in the first passes and the flange is next reduced as speedily as possible. This, it was stated, has a wire drawing effect on the material, resulting in strains that are more or less permanent. The cooling of the beam is likewise unequal owing to the difference in the thickness of the web and flange, a condition favorable to the further development of internal strains. It was the speaker's impression that beams rolled in a universal mill would be more free from strains than those rolled in the ordinary way and he was somewhat surprised to learn that this evidently was not the case. As the beams reported upon were probably rolled shortly before the tests were made, it was pointed out that such shapes, about one year old, might not show as many strains, as they have a tendency to disappear in time.

Prof. Marburg was asked why the tests were limited to beams from 15 to 30 inches in size and the reason for his failure to report on beams under 15 inches which are more extensively used than the larger sections. In reply, he said that the bulk of the tonnage of the Bethlehem Steel Co., is made up of the larger sizes and these furnished him a more complete range of sizes for his investigations than the smaller sections manufactured by this concern.

Another speaker was of the opinion that these investigations could not be compared with actual service conditions owing to the absence of lateral support in the conduct of these tests. Prof. Marburg replied that no lateral deflection was discernible until the elastic limit had been passed.

Measuring Impact Stresses.

B. W. Dunn, in his address on "The Measurement of Impact Stresses," discussed the work that is being done by the United States Bureau of Explosives to insure the safe transportation of this material. The methods of loading box cars with dynamite and gunpowder to prevent the shifting of the boxes and kegs were illustrated with lantern slides.

Recently developed methods of testing galvanized and other zinc-coated iron to ascertain the continuity of the coating as well as the purity of the zinc, were reported by W. H. Walker. He said there were three methods of coating iron and steel with zinc, namely, the hot galvanizing process in which the material is passed through the molten zinc; the cold or electroplating and the Sherardizing processes. In conclusion he stated that tests should be developed to ascertain:

1. The uniformity and thickness of the zinc coating.
2. The continuity of the coating.
3. The purity of the zinc.
4. The toughness and ductility of the coating.

Samples of barb wire were exhibited that had been exposed to the weather from 6 to 30 years. The wire that had been longest in service was in an excellent condition of preservation, indicating that the coating of zinc had been uniformly applied and was of sufficient thickness to resist corrosion. The coating had entirely disappeared from some of the samples that had been exposed only six years and in every case the corrosion was first noticed at the points of the barb where the steel was exposed. It was suggested that barb wire fencing, to protect the exposed surfaces of the points, be given a slight additional coating of zinc in an electroplating tank. The cracking and peeling of the zinc from wire when bent is the reason assigned by manufacturers for not applying a heavier coating. This, it was added, might be overcome by rolling wire subjected to sharp bends after coating to destroy the crystalline structure of the zinc. Dr. C. B. Dudley said that the Pennsylvania railroad specifications on galvanized iron for car roofing call for four ounces of zinc per square foot of material, this amount of coating being required on both sides of the sheets.

The Permanent Mold.

Edgar Allen Custer, Philadelphia, delivered an interesting address, illustrated with lantern slides on "The Permanent Mold and Its Effect on Cast Iron." The results, thus far obtained, indicate that cast iron, when chilled in a permanent mold to the point of setting, and then cooled normally, is greatly increased in tensile strength. In conclusion, he stated that the permanent mold has done valuable service in demonstrating that the simplest heat treatment endows cast iron with characteristics that entitle it to a very large portion of the consideration that has hitherto been enjoyed by wrought iron and steel.

In opening the discussion, Prof. H. M. Howe explained that the metallurgy of cast iron is much more complicated than that of steel, yet he believed that the phenomena discovered by Mr. Custer could easily be explained. He believed that the castings produced in these permanent molds had properties somewhat similar to those of malleable iron. In iron cast in a sand mold, owing to the slow cooling, the graphite separates and forms large flakes, whereas, on account of the more rapid cooling of the iron in the permanent mold, the graphite has no opportunity to separate out and appear in a more widely distributed form.

Plow-points, pipe fittings, brake-shoes and agricultural castings of all kinds are now being made in permanent molds, and the latest development is the casting of threads in fittings. Mr. Custer exhibited a Y in which the threads were cast and they were as uniform and well defined as those cut by machine.

Corrosion of Iron and Steel.

In the absence of A. S. Cushman, chairman of committee U, on The Corrosion of Iron and Steel, the report was presented Thursday morning by Prof. W. H. Walker, Massachusetts Institute of Technology, Boston. The tests under way in the investigation of galvanized steel wire were described, but no results could be reported, as the fence into which the wire was put was erected only last fall. As described by the committee, the conditions of the tests are as follows:

Twelve samples of galvanized steel wire were manufactured by the American Steel & Wire Co., and these have been erected in the form of test fences and exposed to the action of the weather on the grounds of the Carnegie Technical Schools, Pittsburg. The twelve samples fell into three groups in the order in which they were made, and the first sample had the following composition: Carbon, 0.66 per cent; manganese, 0.84 per cent; sulphur, 0.028 per cent, and phosphorus, 0.016 per cent. This steel was made by the basic open-hearth process, and the rods, after cooling, were cleaned by immersion in hot diluted sulphuric acid, then rinsed with water and dipped into milk of lime. The rod was then drawn cold into 9-gage wire. The wire was then galvanized by passing it hrough a furnace in which it was heated to dull redness, and then into a bath of hydrochloric acid containing zinc chloride and lastly into a bath of molten zinc. This wire was not wiped but was permitted to retain as much zinc as would adhere to it.

The second group consists of six samples of "American" style, 8-strand fabricated fencing, 45 inches high. The object of this group is to determine the effect, if any, of segregation of the impurities of the iron. The steel was made at the same mill as the first sample but by the Bessemer process. Six ingots were cast and two billets were

taken, after rolling, from the top of the first ingot, two from the middle and two from the bottom of this ingot. Similarly from the last ingot of the heat, two billets were taken from the top, the middle and the bottom. The rods from these billets were rolled into wire which was galvanized by the hot process but wiped by a mechanical device which left but a thin, smooth coating of zinc on the steel. A separate piece of fencing, about 300 feet long, was then woven from each of the samples. These six samples, therefore, represented the top, middle and bottom of the first and last ingots of the heat, respectively. The heat analyzed as follows: Carbon, 0.09 per cent; manganese, 0.55 per cent; sulphur, 0.045 per cent; phosphorus, 0.092 per cent.

The third group consists of five samples of basic open-hearth steel showing increasing amounts of manganese from 0.07 to 0.37 per cent. The wire made from this steel was all wiped during the process of galvanizing. Because of the location where these samples have been erected, none of the wire will be exposed to the action of the wind, but all will show the effects of fog and dampness which are prevalent at this point.

In addition to the test fences, a number of panels have been mounted in order to test different methods of providing protective coatings for ordinary steel wire fences. One panel is galvanized by the electroplating process; another is made of double galvanized wire carrying about the same weight of zinc as is usually specified for telegraph wire. A third panel is coated with zinc by the Sherardizing process. Ten panels, in part galvanized by the hot-dip process and in part ungalvanized, have been protected by painting with various protective paint coatings. The committee was of the opinion that these tests should in the course of time, yield results of great value.

Iron Versus Steel.

J. P. Snow, of the Boston & Maine railroad, in opening the discussion of the report, exhibited samples of steel which were scrapped after 10 years' service. Wrought iron and steel were used side by side, he said, and while the steel was deeply corroded, the puddled iron stood up well. Steel hoops on a water tank, he added, had to be replaced in three years, whereas some puddled iron hoops have been in service 30 years.

Mr. Walker said that he had gathered data from which a convincing report could be prepared on the superiority of steel and on the other hand iron could be equally well recommended. Good iron and good steel will both resist corrosion, whereas poor material will show poor resistance. In view of the difference in electric potential of iron and steel, he stated that, when used together, the material of low potential will give way first under corrosion. To make a fair test of resistance, only one kind of material should be used in a given structure.

To investigate the effects of corrosion on iron and steel pipe, F. N. Speller, of the National Tube Co., Pittsburg, said that some 500 samples of pipe, used by the French canal builders, had been received in Panama, and in a number of instances iron and steel pipe were exposed together under the same conditions. The steel was made about 20 years ago, when the methods of production were not as highly developed as they are today, and not in one instance did the comparison reflect on the steel pipe. While sometimes not considered conclusive, he stated that the National Tube Co. had made tests of pipe, which by accelerating the service effects, showed in two years the corrosion ordinarily requiring from 15 to 20 years of service. These tests have given important data as to the good wearing qualities of steel as compared with iron.

Mr. Stoughton's Paper.

Bradley Stoughton, metallurgical engineer, 165 Broadway, New York City, followed with an able address on "The Physical Quality of Steel Which Has Been Subjected to Compression During Solidification." In view of the fact that there has existed a difference of opinion among steel makers as to the alleged superiority of the physical qualities of compressed steel over those of steel which has been cooled in the ordinary way, since compression of steel ingots first came into prominent notice more than 20 years ago, and to throw some light on the subject, the speaker presented a series of tables that brought together for the first time practically all of the comparative tests on this subject.

As might be expected, the tests of compressed ingots were generally better than those of ingots cooled in the ordinary way. The ultimate strength of the compressed metal averaged from 3 to 39 per cent greater than the uncompressed; the elastic limit from 1 to 12 per cent better; elongation from 51 to 125 per cent better and the reduction of area showed an improvement of from 60 to 94 per cent. Testimony, however, was not lacking to show that compression is not always successful in producing ingots of good strength and ductility.

Continuing, Mr. Stoughton said, that even if it is admitted that the compressed ingots are stronger and tougher than those not subjected to this treatment, it is not a true practical criterion of ultimate superiority, since ingots are not ordinarily used in service until work has been put upon them which would have the effect of remedying, in part at least, some of the defects which compression would prevent.

The conclusions reached were that compression during solidification lessens the liability of steel to contain the remnants of pipes, blowholes, segregation and external cracks, and partially prevents the development of a weak structure during crystallization Compression also slightly increases the strength of finished steel as well as its toughness under impact. In addition it makes the different parts of ingots more uniform in quality, both before and after rolling. In closing the speaker said that there are at least 18 plants in England and Europe equipped with a total of 30 to 40 presses for the compression of ingots, and there are three or four in this country with about an equal number of presses.

Mr. Stoughton's Paper Discussed.

In the discussion of Mr. Stoughton's paper, attention was directed to the difference between the Harmet process in which a compressive action on all portions of the ingot is secured by driving a tapered ingot through a tapered mold, and the Whitworth process, in which the compression of a cylindrical ingot has a tendency to force the segregate to the outer portion. It was added that the important question to consider is whether fluid compression improves the quality of the metal over and above the closing of the blowholes and the reduction of the segregation by the lifting of the segregate. Whether there is any merit in this forging operation which takes place at a temperature higher than that of ordinary rolling or forging, was questioned. According to Mr. Howard's experiments the Harmet process gives the best results in the outer portion of the section where the rolling is also most effective. In referring to Harmet's published results, it was said that they are largely based on samples taken at the axis of the ingot, where the compression of the ingot would naturally show the greatest improvement. A high elastic ratio was shown by tests of finished steel forged or rolled from compressed ingots, and

the inference was that they might have been finished at lower temperatures than the material from ordinary ingots with which the comparisons were made. The impact tests also gave evidences of colder finishing of the steel from the compressed ingots than that from the ordinary ingots. The question is therefore raised whether the superiority shown for the fluid compressed steel is not due to treatment subsequent to the compression.

Interesting Axle Failure.

"An Interesting Axle Failure" was reported upon by M. H. Wickhorst, of the Chicago, Burlington & Quincy railroad, as follows:

The failure of the locomotive driving axle reported below is interesting and somewhat unusual, being a case of an axle failing because of a crack developing internally, and probably also instructive as showing some of the precautions that seem to be necessary in selecting billets from which axles are made. The axle that broke was a crank axle of a balanced compound Atlantic type engine with an original diameter of 9½ inches. The axle was applied at the West Burlington shops, C., B. & Q. Ry., May 25, 1906, and broke while the engine was hauling a passenger train on July 29, 1907. As stated, this was a crank axle and broke in the middle of the journal under the left driving box. From an examination of the fractured surface it appeared that an old crack existed very largely inside of the axle, and it would seem not improbable that the crack first started inside, continuing both outward and inward, although the point of the beginning of the fracture must be said to be uncertain. An analysis of borings taken near the point of fracture at the outside of the axle showed the following results:

	Per Cent.
Carbon	0.53
Phosphorus	0.036
Sulphur	0.011
Manganese	0.43

This analysis is normal for driving-axle steel, although perhaps the carbon is a trifle high. An etching of the section near the point of fracture showed sound material with no indication of piping, but the center portion consisted of very large crystals, some of them ¼ to ⅜-inch long. This would seem to indicate that the billet was rolled from the ingot before the steel had a chance to solidify in the center, leaving the process of crystal formation to go on even after the work of rolling the billet had been finished. Later, when the billet was forged into an axle at West Burlington, the work of forging affected the metal to only a short distance, averaging not much over 1 inch from the outside. It seems evident that in forging there was a rectangular core that was but little affected by the hammer, which left severe forging strains, which latter resulted in the internal crack.

It has frequently been urged that in buying billets for forgings it is only important to know that the chemical composition of the material is satisfactory and that the process of forging afterward furnished the necessary work to produce suitable physical properties in the finished forging, and the author has been somewhat partial to this view. This experience, however, seems to show fairly definite that it is important to have the necessary physical qualities in the billet before the forging is made and it would seem advisable, therefore, to make physical tests of the billets, obtaining the test piece by means of a hollow drill or otherwise.

Mr. Wickhorst's Paper Discussed.

In opening the discussion, Mr. Wickhorst asked whether a billet of coarse crystalline structure could be so treated that a good forged or rolled product could be made therefrom. In reply, J. J. Shuman, Jones & Laughlin Steel Co., Pittsburg, said that a billet could not be considered a finished product and that the steel manufacturer could not be held responsible for the results of operations subsequent to the production of the billet. In the blooming mill, the question of temperature is not given much consideration, and it is not possible to finish a bloom at a temperature low enough to give a fine structure at its center.

J. E. Howard, in a short paper, added to the data presented last year on the tests of steel columns at the Watertown (Mass.) Arsenal.

Report of Committee.

The report of Committee F on The Heat Treatment of Iron and Steel was submitted by Prof. Henry M. Howe, chairman. Specifications for annealing were tentatively presented without recommendation for their adoption. Different manufacturers follow different methods of annealing, and it was reported that it would probably be difficult to compel all makers to follow these or any other set of specifications.

It was recommended that carbon steel castings containing 0.50 per cent of carbon or less should be heated to 1,000 degrees, Cent. (1,832 degrees, Fahr.) for 12 hours and should be slowly cooled. At no time should the temperature rise above 1,050 degrees, Cent. (1,922 degrees, Fahr.)

To relieve stress, the effects of cold or cool working, etc., rolled or hammered steel should be heated to slightly above the absorption point, about 730 degrees, Cent. (1,346 degrees, Fahr.) and slowly cooled.

Preservative Coatings.

Preservative coatings for iron, steel and concrete were discussed throughout almost the entire session, Friday morning. S. D. White presented a paper entitled, "Paints for Concrete, Their Need and Requirements," and pointed to the absorption of moisture by concrete as a necessity for devising a coating that will insure the dryness of this building material. His statement that linseed oil was a poor vehicle for spreading the coating was questioned and it was claimed that good results had been obtained by the use of linseed oil in concrete paints.

The report of Committee E on Preservative Coatings for Iron and Steel was presented by the chairman, S. S. Voorhees. The progress of the tests of various paints on panels on the Pennsylvania railroad bridge at Havre de Grace, Md., were reported upon, but it is too early to draw any general conclusion therefrom inasmuch as the coatings have not been applied a sufficient length of time to permit of marked corrosion. It is probable that the results of the tests will be submitted next year and photographs will be made of the condition of the coatings as well as the steel after the paint has been carefully removed from the panels. The wooden panels that are being exposed at Atlantic City were recently inspected by the committee and the paint applied to some of these has already worn off not only on one but both sides. The panels coated with white lead paints were found to have chalked considerably, and in general, the tints were in better condition than the whites. A progress report of the tests of linseed oils that are being conducted, was also presented.

Tests of Pigments.

A report of the tests of pigments that are being conjointly conducted by committees E and U proved exceedingly interesting inasmuch as it showed that some of the pigments stimulated the corrosion of steel. Fifty samples of pigments were secured and the tests of the entire lot were made separately by five chemists, members of these committees. As a result, these pigments have been divided into three classes, namely, inhibitors, stimulators and indeterminates. These investigations have, however, not been finally completed, and will be more fully reported upon at a later meeting. For carrying on further tests, the committee has been provided with a strip of land at Atlantic City, purchased by the American Paint Manufacturers' Association. Bessemer and basic steel and refined iron plates, coated with various paints are now being exposed for further tests of corrosion, but no positive report can yet be made.

(Continued on page 91.)

RESTORING WAGES

In Eastern Pennsylvania and the Reasons Given.

Reading, Pa., July 5.—An increase in wages, making a partial restoration of the rates in effect before the reduction of several months ago, which caused a strike by employes of the Reading Iron Co., was announced by the company today, to take effect July 5. The increase means practically from 5 to 8 per cent to the 2,000 employes. The puddling rate is to be increased from $3.75 a ton to $4. This is close to the rate paid before the wage reduction took effect in April.

The following notice was posted at the departments of the company:

"When the big drop in the selling price of iron and steel products took place last February, welded pipe, which is the chief product we sell, was reduced more than any other item. Some steel products were reduced very little, and others, such as steel rails, were not reduced at all.

"On account of the advanced price of pig iron and some of the finished steel products, several blast furnaces and steel works have recently announced an advance of wages. There has also been an increase in the volume of business in the wrought iron pipe trade, but selling prices have not advanced very much as yet, and are still many dollars per ton below what they were prior to the reduction of last February. For this reason we cannot now comply with the request of some of our employes to restore the wages to the rate in vogue before the last reduction. We have decided for the present, however, to restore part of the reduction, and the new schedule will take effect July 5."

The Reading Iron Co. will close its sheet mill for one week, beginning July 5, to give the employes the usual summer vacation. Other departments will also be closed for the same week, when repairs will be made to machinery. The company is busy on an increased number of pipe orders and in the machine departments it is working on orders for cotton presses and sugar mills.

Manufacturers generally in this section report increasing business.

McGugin Receivership.—Receivers have been appointed for the McGugin Iron & Coal Co., Olive Furnace, Lawrence county, O. The company owns Olive and Buckhorn furnaces, both charcoal stacks, and about 17,000 acres of land. Olive furnace was operated in 1907, but Buckhorn has been idle since 1884. The receivership is a friendly procedure to keep the properties intact.

CLASH IN BIDS

Brought About by Rapid Shifting of Figures at Second Bidding.

San Francisco, June 25.—A contract for the structural steel for the new city hospital, 3.500 tons, was this morning awarded to the Pacific Rolling Mill Co. of this city, at $210,600, which was the lowest bid. Dyer Brothers of this city were the only other bidders, at $214,000; and thereby hangs a tale, which may not appear in the official record of the city authorities. Here it is:

This is the second time that work has been advertised and bids solicited within the current month. On the first date of opening bids, the following proposals were submitted: Dyer Brothers, $207,711; Pacific Rolling Mill Co., $217,065; American Construction Co., $221,861; Thompson Bridge Co., $253,042. The bid of Dyer Brothers was the lowest, but it was without a signature, therefore illegal, and could not be considered. The board of public works was about to reject the bid and award the contract to the Pacific Rolling Mill Co., the lowest legal bid which could be considered. Dyer Brothers protested, claiming that the omission of the signature was a mere oversight, an error, and not intentional. The Rolling Mill company claimed that they were the lowest bidders and entitled to the contract.

The Dyer Brothers' plea prevailed, for lack of proof that the omission was intentional, and they were given the benefit of the double. The board of public works readvertised, and the second batch of bids was opened today. Dyer Brothers raised their figures to $214,000, which is $3,000 less than the former bid of the Pacific Rolling Mill Co. But the Rolling Mill company lowered their former figures to $210,000, thereby being the lowest bidder. The contract was therefore awarded to the Rolling Mill Co. It is probable that the American Bridge Co. will furnish a portion of the work to the Rolling Mill company.

The American Bridge Co. has just been awarded the contract for 400 tons steel for the White Investment Co.'s building, corner California and Battery streets.

The structural steel, about 300 tons, for section 9 of the seawall for the state board of harbor commissioners, went to the McClintic-Marshall Construction Co., of Pittsburg.

The contract for 400 tons steel for the new building of Fredericks & Son, and an equal amount for the First National bank of San Francisco, are about to be awarded within a few days.

MACHINERY TRAIN

Sent From Toronto Into Wheat Fields of the Northwest.

Toronto, Canada, July 5.—A train load of 20 cars of harvesting machinery was shipped to Winnipeg and points further west by the Massey-Harris Co. of Toronto, on the 23d inst. Unusually large orders from the west have been received this season, and the company is preparing to ship an average of five carloads per day from now until the commencement of harvesting.

Manager W. C. Franz, of the Lake Superior Corporation, Sault Ste. Marie, Ont., announces that the new No. 3 open-hearth furnace of the steel works has made its first steel. The foundation work on No. 3 blast furnace has been started, and it is expected that in two weeks work will be begun on the new structural steel mill. It will require one year to complete the blast furnace, and about seven months to have the structural mill ready for operation.

The Dominion government has awarded a contract to Doran & Devlin, of Ottawa, for the construction of an experimental plant at Ottawa to be used by the Mines branch under the direction of Dr. Eugene Haanel to ascertain the value of peat in making producer gas. Should the tests be successful it will have an important bearing upon the problem of rendering commercially valuable extensive iron deposits at a distance from the sources of coal supplies, but in the neighborhood of peat beds. The cost of the experimental plant will be about $13,000.

J. S. Larke, Canadian trade commissioner at Sydney, Australia, in reply to an inquiry states that there are no prospects of a profitable trade being done in Canadian stoves, conditions in that city being more adverse than they were 10 years ago. Stoves similar to those made in Canada were introduced into Australia from the United States, but Scotch manufacturers made similar stoves so much cheaper that the trade speedily died out. In New Zealand the outlook is little better, and local

manufacturers largely control the market. A Canadian firm could do a profitable business in heating apparatus, though it would be compelled to change the patterns to those suitable to the climate and possibly have them put together there. D. H. Ross, trade commissioner at Melbourne, Australia, reporting on the same subject, states that it is claimed by Australian stove makers, that they have attained a high degree of perfection in the manufacture of cooking stoves and dealers who for many years handled imported stoves only, admit that they find it necessary to stock the locally made article.

IRON ORE IN LOWER CALIFORNIA.

It has been known for a number of years that there are large deposits of iron ore in Lower California. At present these ores have little commercial value on account of their great distance from any blast furnace center. The ores have, however, great future possibilities both from a national standpoint and as a source of raw material for the iron industries of the Pacific coast. Some persons have been so bold as to state that America will turn to lower California for her next large supply of iron ore, after the Lake Superior mines and those in the south have been exhausted.

From several sources we have obtained the following information regarding the lower California ores. The majority of the ore thus far discovered is controlled by U. S. Grant Jr. and Leslie Webb, who now resides at San Diego, Cal. These interests have patented 1,500 acres under a permit from the Mexican government. The ores are located on the northern half of the lower California peninsula, which is bounded on the west by the Pacific ocean and on the east by the Gulf of California. There are a large number of harbors and sheltered bays on the ocean side of the peninsula. A number of the mines are in the vicinity of San Quintin.

The great majority of the properties are well defined fissures bursting up through the granite and having various dips with the limestone and porphyry. A few are so flat as to appear "blankets." Some of these fissures of ore are from 100 to 200 feet wide and almost perpendicular. One has an apparent width of over 900 feet. Some of the fissures climb up the mountain side for a thousand feet, making it a simple matter to quarry the ore into canyons which lead down to the sea. It is estimated that it will be many years after the mines have been opened before it will be necessary to lift any ore to the surface. The peninsula on which the ore beds lie rises from the sea to the mountains, so the mines will all be on a gravity grade.

Definite information concerning the quantity of ore available has not yet been obtained. The tonnage is estimated from 50,000,000 to 200,000,000, but these figures are scarcely better than guesses. The beds undoubtedly contain the largest known deposits of high grade ore on the Pacific coast of North America.

Engineers have estimated that the ore can be placed on vessels at a maximum cost of 50 cents per ton. The ore can be laid down in San Diego, Cal., duty and freight paid, figuring the duty at the present rate of 40 cents per ton, for $1.50, and at Seattle, Wash., for $2.10 per ton. Contract labor can be used at the mines, the average wage being $1 per day, gold. Strikes are forbidden by the Mexican law.

The ore is of high quality, as is indicated by the following analyses. An analysis made by a firm of English chemists from a sample of 20 tons which was shipped to England shows:

Ferric oxide (Fe_2O_3)	89.640
Ferrous oxide (FeO)	5.270
Alumina (Al_2O_3)	1.400
Silica (SiO_2)	1.380
Sulphur	0.120
Phosphorus	0.032
Manganese	Trace.
Lime (CaO)	Trace.
Magnesia (MgO)	Trace.

An analysis by C. E. Bogardus, chemist, Seattle, Wash., shows:

Iron	64.75
Silica	8.21
Manganese	0.360
Phosphorus	0.049
Sulphur	0.120
CaCO	None.
Magnesium	None.
Titanium	None.

An analysis of the blue limestone which can be had in large quantities near the mines (2,000,000 tons are said to be in sight) shows 98.60 per cent calcium carbonate and a trace of phosphorus.

Skelp Mill Contracts.—The Republic Iron & Steel Co. has awarded the contract for a new 20-inch skelp mill, which will replace the 18-inch mill at the Brown-Bonnell works, Youngstown, and is planning the installation of a new 10-inch continuous skelp mill. These mills will supply the skelp for the operations of the tube works which the company proposes to shortly erect at Lansingville. The United Engineering & Foundry Co., Pittsburg, will furnish the rolls and housings for the new 20-inch mill, the Wheeling Mold & Foundry Co., Wheeling, W. Va., the tables, and the Southwark Engine Co., Philadelphia, the engine. The present 18-inch mill will be torn out.

BRITISH NOTES.

Carnegie Infringement Suit Withdrawn—Tool Steel Orders From America.

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, England, June 29.

Americans will be interested in the announcement made yesterday of the withdrawal of the appeal in the action brought by the Carnegie Steel Co. against Bell Bros. and Dorman, Long & Co., Ltd., some time ago. The action was brought by the plaintiffs to restrain the companies from illegal infringement of the Monell process for the manufacture of steel. After a trial of three weeks Justice Joyce gave judgment for the defendants, on the ground that there had been no infringement. Counsel for the plaintiff company informed the court of appeal that having reconsidered their position they were now anxious to withdraw the appeal. The master of the rolls sanctioned this course.

A disquieting suggestion as to the state of the iron trade is furnished by the prevalent distress in Middlesbrough, which is once more attracting public attention. Recent investigations have led the Salvation Army officials to the conclusion that the position is worse now than during the prolonged depression, mainly because while work is still short, many of the people have exhausted their ability to pawn their goods, and consequently the pawnshops are still stocked with household belongings.

While business is still dull in Sheffield, satisfaction is expressed that much better orders are being received from America for high-speed steel, and a hopeful feeling prevails there that the approaching settlement of American tariff questions will lead to a large amount of business.

The annual conference of the National Federation of Blast Furnacemen held at Middlesbrough this week passed resolutions in favor of the nationalization of railways largely on the ground that the rates of tariffs for minerals in this country are about three times as high as they are on the continent.

Stockholders of the Middletown Car Works, Middletown, Pa., held a meeting recently to consider selling the plant, but no public statement has been made yet as to their action. It is understood, however, that negotiations are being made for the transfer of the plant to interests of sufficient strength to insure the operation of the present plant.

NOTES ON TESTS OF INGOTS AND DERIVATIVE SHAPES IN PROGRESS AT WATERTOWN ARSENAL[1]

By James E. Howard.

Fig. 1—Photomicrograph Showing Slag Globule as Found in Steel Ingot. Globule Surrounded by Ferrite. Magnified 62.5 Diameters.

Fig. 2—Photomicrograph Showing Slag Globule Found in Steel Ingot. Globule Not Surrounded by Ferrite. Magnified 62.5 Diameters.

The question which claims early attention in the examination of ingots and derivative shapes is that of structural soundness and uniformity; the lack of which may result from the partial welding of interior cavities or from the presence of foreign material, slag of whatever chemical composition it may be.

The present tests have been arranged in a manner intended to develop information on the causes which detract from soundness of structure, and to aid in attaining this end the material from the ingot through the several reductions to the finished rails is being examined as it is revealed on both longitudinal and transverse sections of the different shapes. This part of the inquiry has required a considerable amount of machine work in cutting up the material, polishing and etching of the sections, so that photographic records could be obtained.

This preliminary work is largely of an illustrative nature in which the successive changes in appearance of the steel is followed from pass to pass. In this manner it is believed explanatory data will be required, and the significance of those markings which characterize etched steel surfaces in general be made known. A large number of photographic negatives represent the status of the work at the present time.

Beginning with the ingot, the longitudinal and cross sectional slices showed to the unaided eye those cavities due to gases or shrinkage which commonly are found in the ingot. Upon smooth polishing it was found convenient to acquire information upon entrained slag, locating the zones in which slag in globular form was present, counting the number of such globules and measuring their diameters. The positions of the slag zones changed in going from the bottom toward the top of the ingot. When the upper portions were reached, where blow holes were encountered, the slag was found to have gathered in larger beads and rested on the

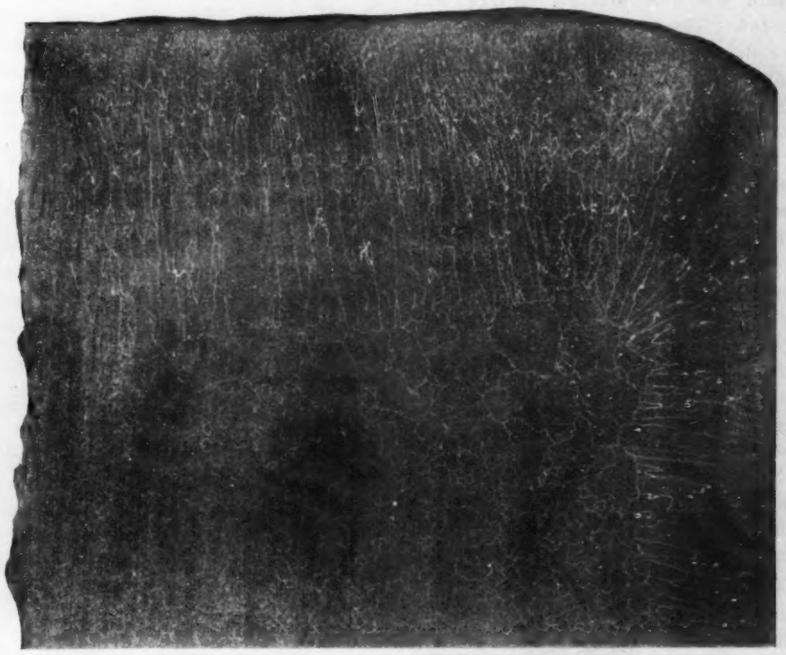


Fig. 3—Cross-Section of Steel Ingot Near Bottom End. Structure Developed by Picric Acid. Natural Size.

[1]Read at Atlantic City meeting of American Society for Testing Materials, June 29, 1909.

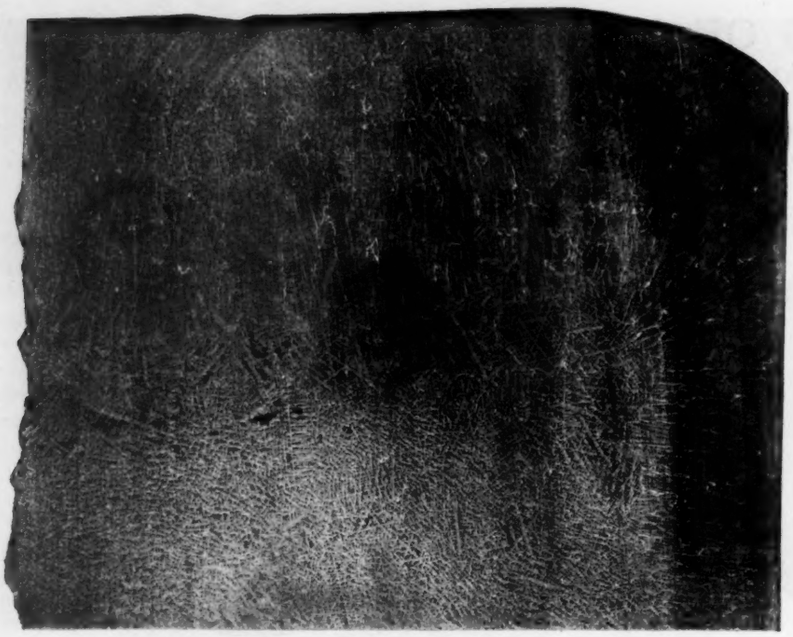


FIG. 4.—CROSS-SECTION OF STEEL INGOT NEAR BOTTOM END. STRUCTURE DEVELOPED BY ETCHING WITH PICRIC ACID FOLLOWED BY TINCTURE IODINE. NATURAL SIZE.

lower walls of the cavities. The appearance of these slag globules is shown by the accompanying photomicrographs, Nos. 1 and 2, the magnification being 62.5 diameters. In one photograph the globule is surrounded by ferrite, in the other it is not.

Upon etching these slices with tincture of iodine a fern-like interlacing structure was shown in the metal adjacent to the sides of the ingot, within which a mottled surface was located. The appearance of the surface developed by the iodine was dissimilar to that brought out by etching with picric acid. It was found that both structures, that developed by iodine and that by picric acid, could be shown simultaneously on the same specimen.

Fig. 3 shows the structure developed by picric acid, natural size, of a section taken near the bottom of an ingot. The elongated grains next the sides of the ingot are shown oriented with their longer axes normal to the cooling surface of the ingot, while within are found grains differing in size but undistorted in their shapes.

Fig. 4 shows both structures, the iodine having been employed on the sample after it had been etched with picric acid.

The fern-like structure is present in a number of the subsequent passes but lost before the final passes of the rail are reached. In the bloom it is faintly visible. The mottled portions are more or less nebulous and indistinct. As the metal is reduced in the rolls the markings generally become more sharply defined, but it will be borne in mind that the intensity of these streaks and darkened places will appear very differently according to the conditions of etching.

Slag inclusions which are globular in the ingot are gradually extended as the metal is rolled down. Fig. 5 shows the appearance of a streak, viewed longitudinally, in metal after the ninth pass from the ingot. When viewed in cross section, this and similar places in the steel showed rounded or approximately circular boundaries. It seems reasonable to suppose that the starting places of streaks or hair-line cracks are at the ingot where slag inclusions initially are found. The query suggests itself whether a hair-line crack may not extend during the rolling of the metal for a greater distance than the slag itself is drawn out. Such seemed to be the case in the specimen represented in Fig. 5. The large number of slag globules which may be present in parts of the ingot are sufficient to account for the short, fine lines or cracks numerous in certain rails which have been examined. In regard to gas cavities, blowholes or shrinkage cracks in the ingot, they disappear from ordinary view quite promptly as the metal is reduced in the rolls. In the final examination of the steel in the finished rail, however, those parts of the ingot which contained most of the blowholes furnish rail sections containing the largest number of streaked lines.

It is further significant that an ingot laid on its side to cool, immediately after stripping, web side up with reference to the rails subsequently rolled therefrom, furnishes rails in which evidence of this treatment is present in nearly all of the rails from whatever part of the ingot they came. Fig. 6 shows the characteristic markings on the cross section of a rail from such an ingot, and the location of the streaks on that side which was uppermost when the ingot cooled.

Some special tests were made on the welding of rail steel, using the stem of tensile specimens for the purpose. Polishing and etching the best parts of the welds made on these specimens, the welding having been done in the open air, gave the results shown in Figs. 7 and 8. While the junction of the the two parts may be easily seen, still there are crystals which extended over this line.

In the case of the granular structure of the ingot, as developed by etching with picric acid, and illustrated in Fig. 3, lines of rupture followed the boundaries of the elongated grains when the metal was fractured by a transverse load. Tests of a similar kind were made on steel from one of the intermediate passes in which metal having a coarse grain was selected. Figs. 9 and 10 show the appearance of the metal before and after loads of compression were applied, the effect of the loads being to cause

FIG. 5.—STREAK IN METAL AFTER NINTH PASS FROM THE INGOT. MAGNIFIED 50 DIAMETERS.

FIG. 6.—PHOTOGRAPH OF CROSS-SECTION OF RAIL FROM AN INGOT WHICH WAS LAID ON ITS SIDE TO COOL IMMEDIATELY AFTER STRIPPING, SHOWING STREAKS ON SIDE UPPERMOST IN THE INGOT.

fractures separating the metal along the ferrite lines. Marks seen near the centers of the photomicrographs were made by a needle point, for the purpose of identification.

In conclusion it may be remarked that the markings commonly brought out on the cross sections of steel rails by etching are believed to be

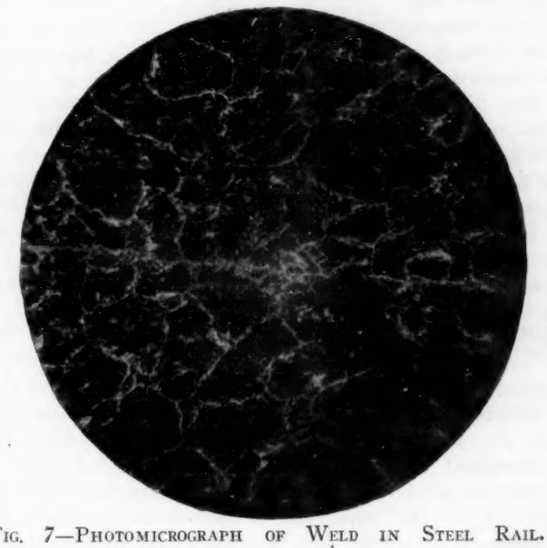


FIG. 7—PHOTOMICROGRAPH OF WELD IN STEEL RAIL. MAGNIFIED 62.5 DIAMETERS.

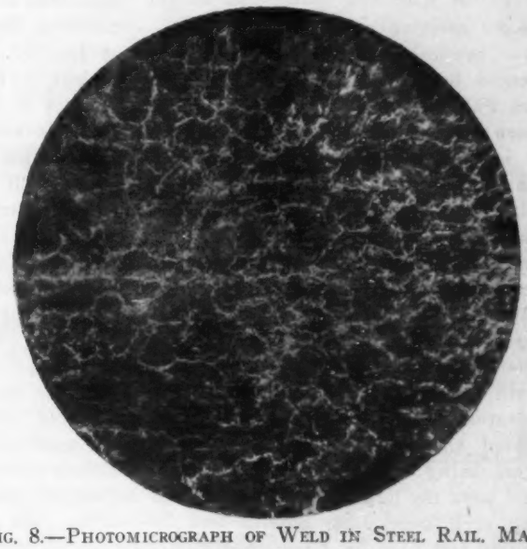


FIG. 8.—PHOTOMICROGRAPH OF WELD IN STEEL RAIL. MAGNIFIED 62.5 DIAMETERS.

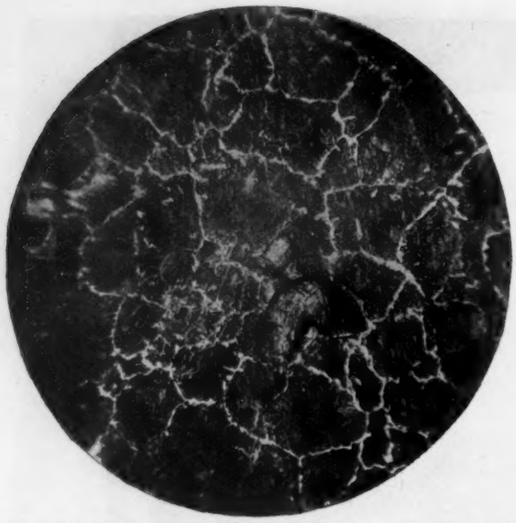


FIG. 9—PHOTOMICROGRAPH OF SECTION OF RAIL STEEL FROM AN EARLY PASS. SHOWING APPEARANCE BEFORE COMPRESSION LOADS WERE APPLIED. MAGNIFIED 62.5 DIAMETERS.

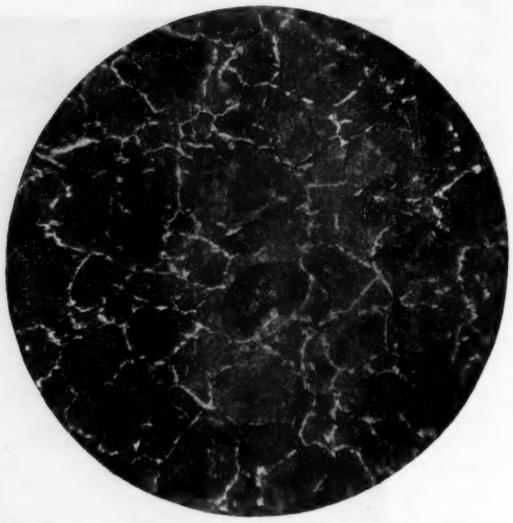


FIG. 10.—PHOTOMICROGRAPH OF SECTION OF RAIL STEEL FROM AN EARLY PASS, SHOWING APPEARANCE AFTER COMPRESSION LOADS WERE APPLIED. FRACTURES DEVELOPED ALONG FERRITE LINE. MAGNIFIED 62.5 DIAMETERS.

those which have their origin in the ingot, modified by subsequent treatment, and that the state of the metal in the ingot, as regards presence of slag and zones differing in structure at this stage, carries through the several passes to the finished rail.

THE SEVENTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

At the sessions of Section X of the congress of applied chemistry concluded in London June 3, a number of papers on electric iron smelting and refining were read and discussed.

The first of these was a resume of the papers on the electro-metallurgy of iron and steel read at the recent meeting of the American Electro-Chemical Society, and was presented by F. A. Fitzgerald of Niagara Falls. These papers have already been abstracted in our columns, and it is only necessary to mention here one or two new points brought out by Mr. Fitzgerald. One of these was—that better effects can be obtained in the Girod type of furnace when working with cold charges than when using hot metal from the Bessemer or open hearth furnace. With regard to the two Heroult furnaces now being built for the United States Steel Corporation in America, Mr. Fitzgerald stated that the electrodes for these were being manufactured at Welland, and were the largest ever made, weighing each over 3,000 pounds and being 10 feet long by 2 feet in diameter.

Mr. Fitzgerald then presented a second paper on the Lash steel process, which will be found in our last issue.

The most valuable of this group of papers however was that presented by M. Clausel de Coussergues, of Paris, on the "Present Position of Electric Iron Smelting and Refining in France." The full text of this paper covers 88 pages of the *Revue de Metallurgie* and is fully illustrated. The following is an abstract of this most valuable paper.

All the electric iron smelting furnaces are, with the exception of the two induction furnaces, of the arc-type. They include the Chaplet system at Allevard, Heroult furnaces at La Praz and Le Saut du Tarn, Girod furnaces at Ugines, their own furnaces at Firminy, their own furnaces at Imphy, and the Keller furnace at Unieux. The confidence shown in the practice is indicated by the fact that furnaces are at work up to a capacity of two tons at Ugines, and three and a half tons at Allevard. When possible waterfalls supply the power—that is at Allevard, La Praz, Le Saut du Tarn and Ugines; elsewhere heat engines are used to produce the electric energy. The duty demanded from the electricity is different in the two cases; in the first instance ferruginous material is charged into the furnaces cold for the production of all qualities of steel, in the second instance the electric furnaces are reserved for refining high-class products. The controlling factor in the cost of production of electric steel is the price of the kilowatt hour. Hence, when this is high, as with heat-engines, it is reasonable to do the preliminary treatment by the open hearth or other process.

Recent additions to the electric smelting furnaces in France are: A 5-ton Heroult furnace installed at the Saut du Tarn Works to replace crucible furnaces. At Ugines a complete electro-metallurgical plant with electric furnaces, rolling mills, forge and foundry, (distinct from the old works) has been installed. The Imphy furnaces have provided the material for M. Pourcel's investigations on these steels; and Unieux has adopted a new form of Keller furnace, consisting of a single cylindrical receptacle with a spherically vaulted cover through which pass four electrodes, two of each polarity.

The Electric Furnace in Operation.

The electric furnace is practically only a heat producer, since the only part of it affecting the reactions chemically is the lining, which is preferably basic. Hence, provided distinctly acid slags are avoided, the whole sequence of metallurgical operations can be produced in the electric furnace. In all French works the operations of making steel are divided into two categories, the first conducted under oxidizing conditions, whilst in the second reducing influences obtain. As neither the ordinary atmosphere nor blown-in air are employed during the oxidizing operations in the electrical furnace, red short metal does not enter into consideration, and in almost

all such works the highly calcareous slags of the basic furnaces are replaced by highly ferruginous ones. These have the advantage of melting and reacting at low temperatures, which are not only favorable to removal of the phosphorus, etc, but also enable the deoxidation to be started at a desirably lower temperature. The solubility of iron oxide in the bath, it must be remembered, augments considerably with the temperature. The reducing operations follow immediately upon the removal of the oxidizing slags and are effected by the usual agents. The products of the reaction must be either gaseous or insoluble in the bath, hence carbon is preferred in the arc-furnaces, and rich ferro-silicon in the induction furnaces. The reducing slags are not of the same character at all works, but the tendency is to have them as acid as the linings of the furnace permit. These slags are more fusible than the slags in basic steel works, and consequently require much less fluor-spar. The reduction, being the result of the interaction between the slag and the bath, if continued long enough, can effect the removal of the last traces of oxygen. When this happens the elimination of sulphur follows; inasmuch as the sulphides pass into the slags and in the presence of lime and carbon or silicon, give rise to calcium sulphide, which is insoluble in the bath. A notable feature of the steels produced in the electric furnace is their low content of hydrogen and nitrogen; the elimination of the former is specially interesting, as it arises from the reaction of the calcium carbide, formed in the electric furnace, with the hydrogen, which then forms acetylene, and passes away. The advantages of the electric furnace are summed up, and a future predicted for its extensive application.

Other papers upon these subjects were contributed by Messrs. Keller, Weiss, and Gin, but limits of space prevent abstracts of these papers being given in this report.

THE NEW HILL FRICTION CLUTCH.

The accompanying illustrations show the new Smith type of Hill friction clutch, as built by the Hill Clutch Co., Cleveland, O.

The positive release feature is new, and eliminates the use of springs formerly employed for disengaging the jaws. An examination of the illustrations shows the continuous toggle connection from cone to jaw, so that when the clutch is disengaged both jaws are positively released from the ring.

It contains another important improvement in design which allows any working part, including the inside jaw, to be removed parallel to the shaft from the mechanism side. This can be done without removing the main spider casting.

Fig. 2 shows how this is possible. Bolted gib guides secure the inner and outer jaws to the spider, this construction replacing the stud formerly used.

Great starting power is claimed. A split No. 60 Smith type clutch, rated at 60 horsepower at 100 revolutions per minute, is said to have shown on prony brake test its ability to start from rest a dead load of 228 horsepower at 100 revolutions per minute.

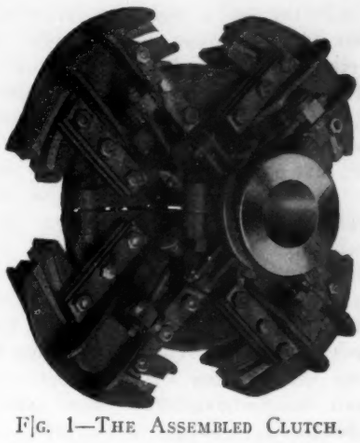


FIG. 1—THE ASSEMBLED CLUTCH.

On account of its rigidity of construction, which is evident from the illustration, the clutch is self-protective. If it is overloaded beyond the limit set by the jaw adjustment, slippage ensues instead of breakage. These clutches are manufactured in sizes ranging in capacity from 5½ horsepower at 100 revolutions per minute to 1,300 horsepower at 100 revolutions per minute.

OIL ON THE COMMUTATOR.

A direct-current generator had been operating satisfactorily on light load. Upon increasing the load to the normal rated capacity, moderate sparking at the brushes began. The commutator was trued up and the brushes readjusted, whereupon the sparking ceased, but only to reappear after a few days.

Careful inspection revealed nothing except a thin greasy film on the commutator and a similar condition of the contact surfaces of the brushes. This was easily removed, but in a few hours it had reappeared, and with it, renewed sparking. The cause of the sparking was now apparent but the source of the troublesome film was still a mystery. Positvely no oil was thrown upon the commutator from either the engine or bearings. The operator insisted that he had not used any oil on the affected parts for some months.

Moreover, minute examination of the brushes disclosed no trace of oil. A suggestion that they might contain this substance from former applications was thought absurd. Nevertheless, it was decided to make sure on this point. The brushes were removed and heated in the flame of a gas stove. In a few minutes there was no doubt as to the source of the commutator troubles. The amount of oil or grease that began to fry out of those innocent looking carbon brushes was astonishing. The frying process was continued until the brushes stopped smoking.

The damaged spots between the bars were cleaned out and filled up and the generator was started and given its full load. Soon the commutator took on a clean dark glaze and has since run absolutely sparkless and without further trouble from this source.—*The Electric Journal.*

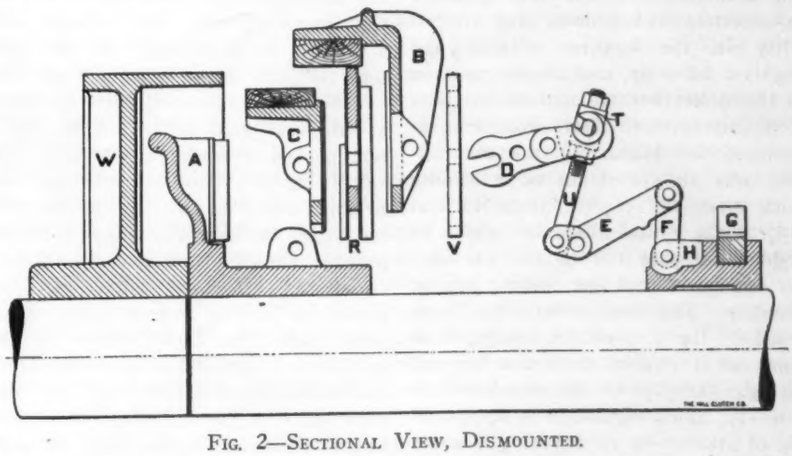


FIG. 2—SECTIONAL VIEW, DISMOUNTED.

A—Spider. B—Outside Jaw. C—Inside Jaw. D—Fulcrum Lever. E—Lever. F—Link. G—Yoke. H—Cone. R—Fulcrum Plate. T—Trunnion Block. U—Eye Bolt. V—Gib Plate.

THE BY-PRODUCT COKE OVEN.

Abstracts of Papers Presented at the Seventh International Congress of Applied Chemistry. London, June, 1909.

The following group of papers upon by-product coke ovens was presented and discussed at the sessions of Section III A, the titles and authors of these being as follows:

"The Koppers Oven and By-Product Plant," by A. Victor Kochs, Sheffield. "The Simon Carves Coke Oven," by E. Lloyd, Manchester. "The By-Product Coke Oven in Great Britain," by D. Bagley, London.

1. The Koppers coke oven is a modification of the Otto-Hilgenstock oven, and is the invention of Heinrich Koppers—formerly of the Otto Hilgenstock Co.

The special feature of the new type of oven is the distribution of the gas and air on each side and along the whole length of the wall of the oven, thus causing combustion to take place from a separate jet placed in each flue. The flues of the Koppers oven are vertical and there being about 30 flues in each wall, each oven is heated at 60 different points, as compared with 6 to 12 points in all other forms of construction at the date of Koppers' patent. The internal distribution of the gas and air amongst the heating flues, renders it absolutely essential that each jet should be accessible for regulation in order to attain uniform heating. The subsequent development therefore has been in regard to the provision of means for controlling this regulation. The first improvement in this direction was to provide an opening furnished with metal or fire-brick plugs at the top of the oven over each flue; the removal of these plugs was effected in a few moments. It was thus possible to ascertain and remedy any irregularity in the heating without the slightest difficulty, and almost as soon as the defect became noticeable. The next improvement Herr Koppers introduced for regulating the combustion was the provision of a sliding brick over the top of each vertical flue, at the point where the gases of combustion pass out of the flue into the top horizontal flue leading to the chimney. This improvement has been found of the greatest advantage, inasmuch as it enables both the air and the gas supply to be regulated to a nicety. This regulation is not possible of attainment to anything like the same degree by any other system.

All regenerator ovens at the present time, with the exception of Koppers', are arranged with a single set of regenerators to serve whole battery of ovens. Herr Koppers' next step was to provide separate regenerator chambers for each oven, thus rendering each oven entirely independent of each other. Of necessity the heating of regenerator ovens is of an intermittent character, as the heating takes place for one period of time (usually 30 minutes) in one half of the oven walls, whilst in the next period the heating takes place in the other part of the oven walls. When only one set of regenerators is employed, the primary regulation of the air and of the draft on each oven is effected by a single slide, which thus has to serve a dual purpose. It therefore follows that it is not possible to efficiently regulate the whole of the ovens in a battery, for while each oven would require practically the same quantity of air, there would be a variation in the draft of the oven according as to whether the ovens are situated more remote or nearer to the chimney, in which latter case of course the pull of the chimney would be the greater. The new system of regenerators enables both the quantity of air and the draft to be regulated with exactitude for each single oven, which is an advantage of great importance.

Recovery of Ammonia.

Until recently the design of by-product plant employed in connection with the Koppers coke ovens was of the ordinary description, and such as is universally employed at all gas-works. About 18 months ago Koppers conceived the idea of recovering the ammonia direct from the gas in the form of sulphate of ammonia without the employment of a water-scrubbing process. A system having the same object in view and known as the Brunk process, was brought out a number of years ago. In this system the foul gases coming from the ovens were conducted directly into a sulphuric acid bath, but the system proved unworkable owing to the salt being contaminated with tar and organic matters, and owing to the tar being detrimentally affected by its passage through the acid. To overcome the difficulty which was experienced in this system, Herr Koppers cooled the gases down to the ordinary temperature for condensing the ammoniacal liquor and tar, and after passing them through a superheater conducted them into an acid bath. The superheating enables the gas to be passed into the acid bath without condensation taking place, and even to evaporate the water released in the formation of the sulphate. This system has worked with the very greatest success, and although it is only within the last twelve months that the process has been put on the market, there are now five large plants in operation and six under construction; plants which in the aggregate together deal with the gases from 900 ovens. The advantages of the new system are numerous, and of a most important character. The main features are, the simplicity in the design, the reduction in the amount of water necessary, the reduction in the quantity of effluent by one half, the reduction in the consumption of steam, increased yield of ammonia, and less wear and tear on the plant.

The Carves Oven.

The paper by Mr. Lloyd of Manchester dealt with the Simon Carves type of coke oven. After referring to Hilgenstock's researches upon the subject of the progressive carbonization of the coal in coke ovens, published in a paper read before the German Association of Gas and Water Engineers in 1902, the author gave a description of the latest improvements in this well known type of coke oven.

It had been the aim of coke oven builders to design an oven which should insure the uniform heating of the walls, facility of the control of the heating arrangements, economical utilization of the fuel gases, and strength of the structure. In these are embodied the most favorable conditions for the production of the best quality of coke, with a maximum yield of by-products, whether of the vertical or of the horizontal type, of regenerative or non-regenerative oven.

The Simon Carves coke oven is of the vertical flued type, and is designed to work either on the regenerative or the non-regenerative system. It fulfils the above conditions to a high degree.

The gases pass from the outside through channels to chambers under the vertical flues, and are regulated by a series of cocks. The supply of air is allowed to pass along the horizontal channels, disposed under the sole of the oven from where it passes to the gas chambers, and is regulated by dampers inserted in these channels through openings in front of the oven, and closed with removable plugs. The regulation of the gas and of the air required for its combustion, is thus entirely effected from the outside of the ovens.

The flames resulting from the com-

bustion of the gas rise in the vertical flues, pass along the horizontal flues, and descend vertical flues, then pass through the openings into various chambers, and down ducts into a regenerator, heating the checkered brickwork and passing into the waste gas flue along which they travel to the chimney.

When the checkered brickwork in one generator has been sufficiently heated, and the air passing along the corresponding regenerator has extracted the heat from this regenerator within the prescribed limits as is usual in such practice, the whole arrangement is reversed. The reversing arrangement consists of a set of dampers, actuated in pairs, on the regenerators. The air for the combustion after traveling through the air galleries in the foundations of the battery, where it receives a preliminary heating, passes through apertures, one for each half of each oven, and through a flue into the air distributing chamber, and thence through the flues and compartments to the top of the distributing chamber. The amount of air is regulated in each of these compartments by dampers or stoppers of different thicknesses, introduced from the outside into air channels through plug holes.

With regard to the recovery of the by-products the methods adopted are similar to those in use in modern gas works plant, and the apparatus used in these plants, is readily adapted to the treatment of coke-oven gases and by-products.

The By-Product Coke Oven.

The third paper on this subject was contributed by Mr. Bagley of London, who outlined the progress made in Great Britain in the by-product coke industry and indicated in what directions chemical research was required, in order to overcome the present difficulties of the manufacture of coke and recovery of the by-products.

Mr. Bagley first referred to the historical development of coke oven design and to the early British patents of the years 1781, and 1838 to 1840. The author stated that in the United Kingdom there were now about 3,000 coke ovens in operation, half of these being of the vertical type and half of the horizontal.

Messrs. Samuelson, Priestman, Cochrane, Guest Keen & Nettlefolds, and the Consett & Cargo Fleet Co., possess ovens of the vertical flue type, and on the other hand Messrs. Bell Bros., Bairds, and The Shelton and Brymbo Co. favor the horizontal types, and other eminent iron masters are giving practical trials to both types. Durability and efficiency over a period of years are the only decisive factors, and the author inclined to the opinion that future progress will be in the direction of heat regulation and distribution; easily and cheaply renewable linings for the ovens, a greater yield of ammonium sulphate, and a form of construction lending itself more easily to variations in the demand or output. Great Britain had not yet faced a prolonged stoppage of ovens and become acquainted with the heavy expenditure occasioned by a restart.

Discussing the preliminary treatment of coal the author stated that in washing the chief object is to increase the ratio of carbon to that of the ash and sulphur, which form the undesirable elements in the raw fuel. Salt occurring in combination with the coal and mineral matter, has been the cause in the past of much trouble in connection with the working of by-product ovens by reason of its fluxing action on the refractory materials. The discontinuance of the re-use of the wash water has done something towards the reduction of salt. Where coal is washed it is desirable to have large capacity draining-bunkers, especially if the aqueous absorbent capacity of the coal be high. No attention has been paid until lately to the hygroscopic water in certain coals, but its influence on the protraction of the coking period has now been determined. When it is considered that in some cases coals containing 5 per cent and absorbing an extra 10 per cent of water from the washing operation are coked, and that the whole of this moisture has to be driven off (consuming a given number of heat units in the process) it is not surprising that the coking period should be protracted, reducing the average capacity of a complete plant by 10 to 30 per cent.

The fusing element in coal, now generally accepted as disposable hydrogen, is made full use of and poor coking coals are always improved by fine crushing.

Where several descriptions of coal are employed in the production of furnace coke, intimate mixing is a matter of the first importance. The rough and ready method of discharging trucks of various descriptions into a common elevator pit and trusting to the washing and crushing process to effect mixing is faulty and untrustworthy. When trouble has been experienced in this respect, the remedy has been found in mixing immediately prior to the crushing operation by accurate and automatic adjustments. No standard density or porosity can be attained if this process is not thoroughly carried out. Compression of the coal before charging into the ovens, by conferring density to fuels which otherwise would lack strength and cohesion, is advisable with inferior coking coals.

The author then described the usual coking process as carried out with the bee-hive and other forms of coking ovens, and he pointed out that the determination and the influence of the moisture in the coal used, had not yet been sufficiently studied. In the bee-hive form of coke oven, the coke was cooled inside the oven, and thus contained a low percentage of moisture. This was a distinct gain for blast furnace work, since all the moisture present in the raw materials had to be evaporated and caused loss of heat.

The author's conclusions, based on a series of tests, are that generally the unit consumption of coke, made from identical coals in the beehive and retort ovens, favor the beehive variety slightly. The economic advantages derived from the use of the retort oven, however, far outweigh any inferiority of its product, and as its design and construction progress, the question of quality may ultimately favor the by-product oven.

Refractory Materials for Oven Construction.

Refractory materials and linings were then dealt with, and the author stated that English materials and linings for coke oven construction were now quite equal in quality and durability to those of continental manufacture.

Finally, the author discussed by-products, and stated that as regards benzol its recovery was not now generally carried out, as there is direct evidence of over-production and there was much difficulty in finding a market for the various qualities produced. The gas industry is using little for enrichment purposes, owing to the introduction of the incandescent mantle, and other markets are restricted. Ordinary commercial qualities are unsuitable for motor use, and this fact had led the author to carry out experiments with specially refined qualities, requiring no alterations to the carburetting appliances usually fitted to cars. In this direction moderate success had been attained. Special apparatus is however necessary for the recovery (and rectification) of the light oil, proposed to be used for motor purposes.

Attention has lately been directed to the production of nitric acid and

nitrate of ammonia direct from ammonia gas, the result being a process which is successful both chemically and commercially. This process is not new, and depends upon the fact that ammonia can be oxidized to nitric acid in the presence of oxygen, by the catalytic action of platinum. Its successful commercial application has been carried out, and a plant is working in connection with a battery of coke ovens in Germany, producing nitric acid at a cost which compares very favorably with that of the usual nitrate of soda process. The apparatus required consists of ammonia stills for the preparation of dry ammonia gas, the apparatus for the reaction, and the condensing plant. The reaction is a very simple one, ammonia gas, mixed with air, is forced rapidly through a plug of platinum, arranged to expose a large contact surface. For every 17 parts by weight of ammonia used, 63 parts by weight of nitric acid are formed. The product consists of nitric acid, of 36 per cent Be., if higher strengths are required a concentrating plant is added.

Nitrate of ammonia can also be made by this process, by neutralizing the nitric acid made, with a further supply of ammonia obtained from crude gas liquor; the solution of ammonium nitrate so obtained, is then evaporated until crystallization occurs.

COMPOUND PNEUMATIC FORGING HAMMER.

Recent years have witnessed a grea extension in the use of pneumatic pressure in forging shops, and its application to hammers for light or heavy forging work, such as is met with in large forge shops, presents a wide field, the application of pneumatic power to forge hammers being practically in its early stages. The use of hand tools of the light percussive type has familiarized forgers with the cleanliness and convenience of pneumatic power, but the steam hammer has not yet to any great extent been displaced by the air hammer, although with the advantages to be derived from the use of the pneumatic hammer once fully realized, it is reasonable to believe that the more general use of this type of hammer where the necessary air pressure is, or can be made, available, will follow. The economy of operating hammers of this type is a particular point for consideration not only in connection with new, but also in established plants, being claimed to be a step in the direction of lowering costs.

The improvements that have been made in recent years along the line of gas producers and gas engines have made producer gas an ideal and economical source of power for forge shops —broadly speaking, the scheme being to run the forge furnaces with the water gas, and the gas engines which drive the compressors with producer gas, in this way eliminating steam and steam boilers.

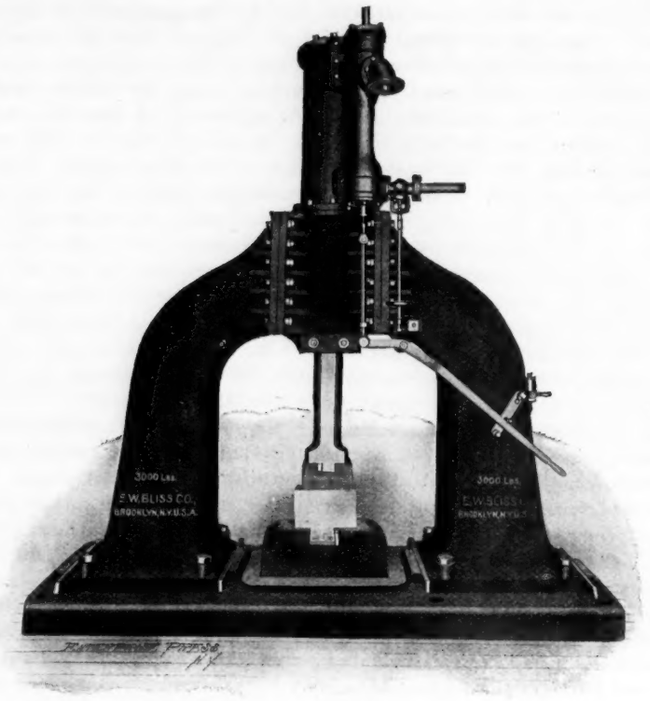


FIG. 1—COMPOUND PNEUMATIC FORGING HAMMER.

Fig. 1 illustrates one of several sizes of compound pneumatic hammers as built by the E. W. Bliss Co., Brooklyn, N. Y.

Owing to the construction of the hammer the amount of air used on ordinary blows is only half the volume of steam which is used in the same cylinder capacity of steam hammers. In addition to this there is no working out of the hammer on account of condensation, as the operator can strike a single full weight blow no matter how long the hammer has remaianed idle. For this reason one blow means one cylinder full of air in place of a number of preliminary strokes and then the effective blow, which is the practice with steam hammers. Additional economy can be attained by preheat-

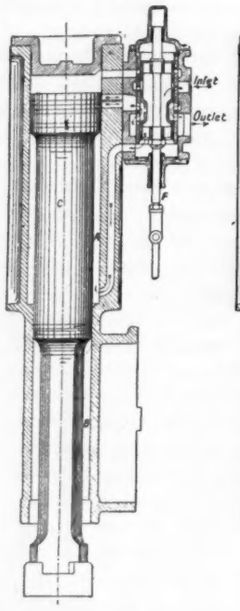


FIG. 2.

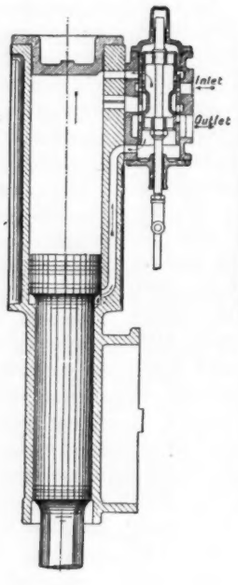


FIG. 3.

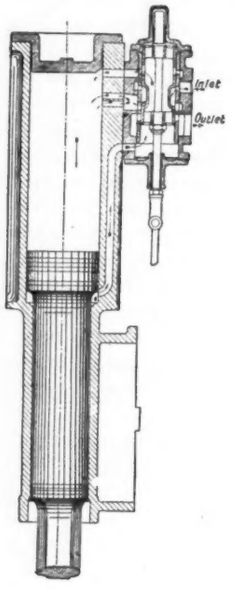


FIG. 4.

ing the air. which can be done in an ordinary pipe heater, the heat being derived from the furnace stack or the exhaust of the gas engine.

There are also the further advantages that the hammer can exhaust direct into the shop and in this way aid the ventilation, and there is no danger of pipes freezing in winter.

The hammer is simple in operation and said to be very positive in its action, and to be much easier to run than the ordinary steam hammer on account of its striking one blow and then returning to its upper position. For this reason the operator does not have to be skilled nor even quick motioned to get a satisfactory blow. The hammer is besides, always cold and there is no dripping of water nor sputtering of steam leaks, which are not to be entirely avoided with steam hammers. Where the air supply cannot be derived from a gas engine economy is most important and the fact that the hammer only uses air when striking a blow, there being no automatic parts furnished on these hammers, so that the operator cannot let the hammer run idle, is a valuable feature.

The hammer as regularly built, strikes blows of two distinct values; one, the ordinary blow, which is due to the heavy falling piston with the lifting air expanded above it; the other being derived from the weight of the piston with full air pressure above, giving a blow approximately 50 per cent heavier than the ordinary. This extra heavy blow can be given at the will of the operator, it being only necessary to depress the hand lever slightly more than for ordinary blows.

In Figs. 2, 3 and 4 are given sectional illustrations of the hammer showing the ram and valves in their different relative positions. Fig. 2 shows the holding-up position; Fig. 3 the position of parts when striking an ordinary blow, and Fig. 4 the positions of the valve and ram when making an extra heavy blow. The ram, piston and jaws for securing the die are forged from a solid steel ingot and the section of the ram is nearly uniform throughout, while the cylindrical portion of the ram is almost entirely contained in the guiding cylinder when the blow is struck. As will be seen from the sectional drawings there are two cylinders, A and B; the upper one, A, being the working cylinder and the lower one being used as the guide only. The upper end C of the ram working in the uppermost cylinder A is in the form of a differential piston. High-pressure air is admitted in the direction of the arrows (Fig. 2) when raising the ram only, and this same air on being exhausted is expanded above the piston for striking ordinary blows, the path of the air being shown in Fig. 3. If, however, a very heavy or stamping blow be required, the operator can utilize the full air pressure from the compressor above the piston in addition to that discharged from beneath the piston, the valves being constructed with two sets of ports as shown in Fig. 4.

The construction of the hammer is very simple, the operating valve being cylindrical, of cast iron, with suitable ports working in a cast iron liner. For the reason that warming up is unnecessary the automatic striking attachment usually found on steam hammers has been dispensed with, and the valve controlled by one hand lever, hence the hammer is more simple to operate.

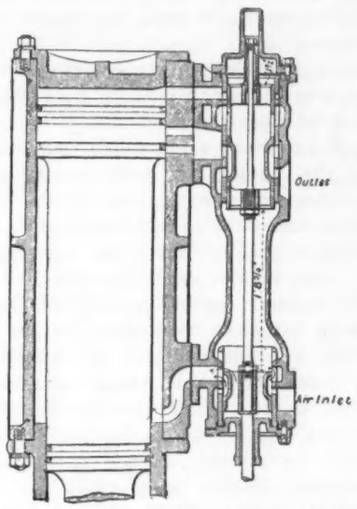


FIG. 5—VALVE CHEST FOR HEAVY HAMMER.

A brief study of the sectional drawings will serve to illustrate the fact that owing to the difference in the areas of the annular space below the piston and that of the top of the piston, the air which has been used to raise the ram will be expanded to nearly four times its initial volume and will finally be exhausted at about atmospheric pressure by the raising of the ram again.

The hammers are substantially constructed, having few wearing surfaces and are well lubricated, while their method of operation is simple. Any weight of blow, light, regular, extra heavy or holding down, can be given by the movement of the lever. When the latter is released the ram rises and remains in its highest position. Fig. 5 shows in section a cylinder with an alternative form of valve chest. This design is used for the heavier types of hammers.

Large structural steel jobs is another field for which the portable type of pneumatic hammer presents many advantages. On this work there is a large amount of tool dressing and small forging jobs to be done. On such jobs there is usually a compressor for supplying the necessary air for the riveting tools, which can also be used for operating the hammer.

ENGINEERING RESPONSIBILITY.[1]

(Continued from last issue.)

No doubt many will claim that inferior or insufficient compensation is the most fruitful cause of poor quality of work at the hands of those who, in our industrial system, play the part of hewers of wood and drawers of water. But if we are right, the experience of the last few years has not seemed to confirm this view. If this was the real explanation it would seem to necessarily follow that voluntary increase in wages would bring an increase in efficiency. On the other hand, if we may trust the indications that we have been able to gather, the increase in efficiency following voluntary increase in wages has been most disappointing. We must apparently look further for the real reason for poor workmanship.

Matters of Compensation.

In our judgment, the method of compensation for work performed has a direct and most important influence on the quality of the service rendered. We refer especially to the piecework system in those places where it is applicable, and to the payment of all interested in proportion to the amount of successful output, which is so common in the steel industry. Both these methods of compensation stimulate output at the expense of quality, and it is not at all strange, perhaps, that after constructions have found their way into service, we should not infrequently find evidences of the haste, the slurring over, and the inferior workmanship which these methods have necessarily done so much to stimulate. We are not at all prepared to suggest any substitute for them, and we are, and have been for many years an advocate of them from the standpoint of successful management; but it is folly for us to close our eyes to the fact that the piecework and other successful output methods of compensation

[1]Presidential address delivered before the American Society for Testing Materials on June 29 by Dr. Chas. B. Dudley.

of workingmen are antagonistic to quality of work, and that, despite all our efforts to the contrary, they may justly be held responsible for some of our engineering failures.

Lack of Loyalty.

One more phase of the workman problem. Close observers of the modern workman have noticed for some years a growing tendency on his part to manifest less and less interest in his work. Esprit de corps, pride in his work, and a genuine feeling of loyalty and devotion to the establishment of which he forms a part are gradually becoming less and less. The allegiance of the workman, under the influence of the ferment and agitation which now pervades our whole industrial system, is gradually passing over, in a measure at least, to the labor organization. Instead of co-operation there is ofttimes antagonism. Instead of zeal and earnestness on the part of the workman to do his best there is study how to make the organization stronger and secure greater benefits for himself. The effect of this transfer of allegiance on the quality of the work performed needs no elucidation.

Valuable Side Light.

It is not at all our purpose to discuss the labor problem, and this statement of the situation is cited only because it throws a valuable side light on the question we are considering. We may, however, be permitted a single statement, viz.: We are firmly convinced that if labor organizations would devote less time and energy to contention with employers and more effort toward making the organization stand for skill and plain, simple honesty in workmanship, and for fair dealing with, and reasonable devotion to, the interests of employers, all questions connected with the recognition of the union would fade into insignificance and collective bargaining would be welcomed, nay, even sought for, by those who are managing the great industries of our modern civilization.

Heavy Responsibility.

Third, it is evident that the engineer who makes or finally decides upon the design of any structure carries a heavy load of responsiblity. He is first in the field and practically tells all who follow what is to be done. He must decide not only the kind of material that is to be used but also the amount or sizes, and how it shall be disposed. His realm embraces every kind of structure, from the foundations of a bridge or building to the most minute detail of a locomotive or car. In railroad track he says or should say what weight of rail shall be used, the number of ties per rail, and the kind and depth of ballast. His knowledge of the properties of materials used in construction must necessarily be broad and comprehensive, and the field is so enormous that there are naturally numerous specialists, each being able to cover and be an authority in, only his own paddock.

Two Difficulties.

The engineer who makes the design labors under two very serious difficulties. First, it is not possible, many times, to compute the strains to which the whole or parts of the structure will be subjected. Perhaps we can make this point clear best by considering the locomotive driving axle. The strains produced, when we regard the locomotive as a vehicle, are simple and easily determined. So likewise the bending moment produced by the action of the steam on the piston, as well as the torsion strain produced by the crank. But who can tell the bending moment produced by the lurch when the wheel strikes a curve at high speed? Who can even give a guess at the strain produced when the brake is applied, making an emergency stop at 60 miles an hour? Moreover, the tendency of the times is toward larger and larger structures. And as the parts increase in size, would any of us be willing to say that the strains in each part would increase directly proportional to the increase in size of the whole structure, or that a proportional increase in size of any given part would so successfully meet the increased strains as did the corresponding smaller parts of the original structure? The engineer who makes the design, perhaps more often than any of us, is at the end of his knowledge, and if failure comes, due to defective or faulty design, deserves, in our opinion, more sympathy than any one else involved.

Designer's Troubles.

But the designer labors under another serious difficulty. He is often overruled and prevented from doing what his judgment prompts him to do, in the interests of safety, by those who control expenses. The construction he would like to use costs more, and the management for economic reasons demands something less expensive. Of course, under these conditions, much responsibility is taken off the designer. And while we are ready to allow that some check is desirable, since those who make the design are, after all, human and naturally will take care of themselves, we cannot but feel that this check should be sparingly applied in all places where safety to human life is involved.

Unfair Treatment.

Fourth, unfair treatment. As already indicated, there is a natural disposition on the part of each of us to relieve ourselves from blame and put the fault on some one else, and if our observation is worth anything there is no field of parceling out desserts among those involved in failures and the responsibility therefor more fertile than this one of unfair treatment. This field is the especial paddock of the maker or producer of material. If a rail breaks or fails in service there was, says the rail maker, something wrong with the track or with the locomotives or cars that run over it. If a car wheel breaks or fails to give the guaranteed mileage, the track was too rough, the use of the brakes too severe or the loading too heavy, and so on. Far be it from us to say that unfair usage is not many times a legitimate explanation of failures. If a freight locomotive, designed to haul a heavy load at 20 miles an hour is used at times on a passenger train at 40 miles an hour, and in so doing shakes herself to pieces, the fault is certainly not in the materials nor in the workmanship, nor in the design, but in the unfair use. If, due to the growth in size of locomotives and cars, an old iron bridge, designed for not over two-thirds the live load which is actually put upon it, gives way and produces a disaster, the responsibility rests with the operating officer rather than with the bridge engineer. These examples might be multiplied to almost any extent, but perhaps enough has been said to make the point clear.

(To be continued.)

CRAMPS' ANNUAL REPORT.

The Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, reports for the year ended April 30, last, as follows:

	1909.		Changes.
Net profits	$747,949	Inc.	$192,214
Charges	301,796	Dec.	11,212
Surplus	$446,153	Inc.	$203,426

At the recent annual meeting, Harold S. Smith was chosen a director to succeed J. W. Dunn. The other directors were re-elected and afterward the officers were also re-elected.

THE SMALL PRODUCER GAS PLANT FOR SHOPS.

By A. S. Atkinson.

The small suction producer gas plant for shops secures economy of operation where conditions are favorable and installation is according to the best engineering standards, but the difficulty of getting highest results in all cases is so dependent upon many details that data collected from many sources show wide variation. In too many shops so little attention is paid to the keeping of cost sheets that it is largely a matter of guess work as to the actual cost of operation per horsepower used.

I recently visited a machine and forging plant in Connecticut where a 100-horsepower gas engine had been in operation for a year. The suction gas producer was one of the best in the country. The company were makers of stock and special forgings for carriages, automobiles, guns, sewing machines, and bicycles. It was impossible for the managers to say how much power they were using from the engine, but thought about 50 to 60 horsepower, as the load is quite variable and no attempt was made to keep track of the amount of power actually consumed in the shop. They used about 800 pounds of coal per day, but it was believed that if the full amount of power was needed very little more coal would be used. At any rate the full 100 horsepower could be obtained at a fuel consumption of coal of about 1,000 pounds per day.

Cost of Operation.

The company was satisfied with their investment, and considered that the coal consumption was relatively small and the cost of care and maintenance very slight. But for the sake of engineering practice this was not satisfactory. This same difficulty in collecting data regarding the exact operation and cost of a small suction producer plant in shop work has been experienced elsewhere. In modern steam engine plant the attendant in charge is usually required to show his cost record sheet from week to week, and his fuel consumption must have a relative bearing upon the amount of horsepower generated and used. For the sake of the profession the owners of producer plants should insist upon some similar practice to show whether the plant is really doing its duty.

In another shop in New Jersey where a small producer plant has been in use for a year as a supplement to an existing steam power plant somewhat more detailed records were obtained. A 225-horsepower suction producer was installed with a three cylinder vertical gas engine designed to develop 140 horsepower. The gas engine is direct-connected to a 100-kilowatt and a 25-kilowatt generator which furnish power and lighting to the whole plant, which operates 10 hours a day with a half day on Saturdays. The producer is banked on Saturday and remains idle over Sunday.

Here too the difficulty of ascertaining the exact unit of coal consumption per horsepower hour is enhanced by the fact that the producer also furnishes gas to three hardening and one brazing furnaces. After making due allowances for the gas consumed by these furnaces, the data seemed to indicate that the unit consumption per horsepower hour was between 1½ and 2 pounds of coal. It is possible that the allowance made for the furnaces was under rather than over the amount actually used. But without figuring on the cost of the city water used for cooling the engine, it appears that the actual consumption for the larger unit was considerably under one and a half pounds of coal per horsepower hour. According to the records of the year about 1,478 pounds of coal were used for each working day, but as some of this was used in the steam part of the plant this does not furnish reliable data.

Mistaken Results.

In a western machine shop where a 60-horsepower gas engine was operated by a suction type of producer it was confidently believed by the superintendent that only one and a half pounds of coal were consumed for each horsepower hour. Just how he arrived at this conclusion it was not so easy to explain. But that was the figure he gave out, and no one disputed it. He was satisfied, and why should not others be? The matter would have rested there had not the manufacturer of the producer sent an expert there to get reliable figures for using later for advertising purposes. The expert was given free access to the plant and instituted a test to secure data, when he found that no exact figures were at hand. The results of his tests disappointed him. Instead of one and one half pounds of coal per horsepower hour, the plant was actually using from two to two and a half. It was a disappointment to both, for the superintendent was inclined to be angry at finding that he was not operating his plant as economically as he thought.

The trouble was not so difficult to locate. Instead of using a high grade bituminous coal which the plant had been built for, the superintendent was burning a very low grade which he had been enabled to pick up cheap. This coal cost him 25 cents a ton less than the grade the plant had been in the habit of using. For each 25 cents he was saving on one end he was burning up several times that amount on the other. The gas generated from this poor coal was of inferior quality, and the engine was not properly suited to handle it profitably.

This case is merely cited as an illustration of the mistake made in not keeping track of the amount of fuel consumed in producers according to the amount of power delivered and used. There is too much guesswork, and as a result there is a distinct loss which may not appear at first sight.

Cleaning Out.

The suction producer for machine and other shops has given excellent results in a great many plants, and the need of the day is more reliable data drawn from a variety of sources which will show not only the relative cost of fuel for each horsepower delivered but the cost of maintenance and operation. In a western shop where a suction producer has been in operation for some time, the attention required to keep it in good order has been comparatively small, but on the other hand the operator in charge goes through a regular course of cleaning and inspection once a week. This undoubtedly has had much to do with the low cost of maintenance.

The custom has been to clean the fire thoroughly once a week after the shop has shut down for Sunday. As the plant will not be in operation on Sunday as many of the ashes are removed as needed without affecting the fire or the quality of the gas. This plant is not operated through the week more than a part of the time anywhere near the load capacity, and as a result the removal of many ashes and cleaning has a tendency to disturb the quality of the gas. Consequently there is not sufficient depth of ashes to permit of thorough cleaning except at the end of the week. Through the week the producer is charged with small quantities of coal at comparatively frequent intervals, and small quantities of ashes are

likewise removed from day to day. Besides cleaning out the ashes thoroughly on Saturdays, the igniters are thoroughly cleaned of all carbon and soot. The mixing valve is removed and all dust carried through from the producer is removed. The exhaust and other valves are inspected and cleaned, and when needed they are ground to their seats. All parts needing it are carefully oiled and inspected, and general attention given to all minor points.

Overhauling.

This weekly overhauling of the producer plant means less cost of maintenance and longer life with added efficiency. There is no waiting until something happens. If any part shows signs of weakness, friction or wearing, the trouble is remedied at once or attended to the following week when new parts are ready for replacing. When Monday arrives the producer is ready for another week of efficient operation, and there has never been a breakdown or trouble that could interfere with the shop's regular work. Owing to the variability of the load of the shop some doubt was experienced at first whether a producer would answer the purpose, but all such doubts have been removed by careful attention.

The dust problem in producer plants has caused some factories installing them uneasiness, but it is a problem that disappears with careful attention to the producer. It might be said that there is a dust problem with an ordinary furnace, and so there is unless the flues and pipes are cleaned and kept clean. The same is true of the suction producer gas plant. The cleaning of the dust should be a part of the operator's weekly work. If this is done regularly and thoroughly there is no danger of depreciation and inefficiency from this cause.

We have not learned as much about the vagaries of a producer plant yet as of the gas engine which has been with us longer. Every engine has its peculiarities and sometimes these give a good deal of trouble. Most operators know the symptoms of a gas engine and can tell when there is trouble brewing by its sound or actions. It is a pretty poor gas engineer who does not locate the engine's trouble shortly after it makes itself known by back-firing, muffled explosions, intermittent or unusually loud explosions. But too often the gas engine operator does not understand the producer so well, and when there is trouble in the engine he is at a loss to understand how the producer can cause it.

Results of Neglect.

For instance an operator of a producer plant in a machine shop nearly caused serious destruction to the producer through neglect of one little detail. One of the engines operating on the producer suddenly commenced backfiring. As the engine had been cleaned only two days previous the trouble was a little puzzling, especially as the other two engines ran without trouble. Besides backfiring the engine would lose in speed and almost stop at times. Every possible cause of the trouble in the engine was hunted for, but to no purpose. It was only after much delay and when an expert was called in that the difficulty was traced to the quality of the gas and the producer itself. The openings or perforations in the bell-shaped sprinkler had been entirely stopped up by soot and dirt, possibly due to too heavy charging or lack of proper attention when refilling with coal. At any rate the closing of these holes caused all the trouble. The hot gases then dried out all the moisture from the baffling material and consequently increased the amount of dirt and soot. The water instead of flowing through the sprinkler openings passed outside to the shell of the producer. The result of this was that the volume of gas expanded under the extraordinary temperature and carried its impurities through the dry scrubber. It was these impurities and the deterioration of the quality of the gas that caused the backfiring in the engine, and if it continued long enough it would have put all three engines out of commission and entirely ruined the producer itself. Fortunately the engine told the trouble and thus saved the day.

Cooling Water.

This should teach an operator the necessity of attending strictly to business and not letting trouble get past his watchful eye. There is no excuse for an operator letting his gas get too hot without discovering the cause either by his test flame or his vacuum and pressure gages. Not only this, but the sprinkler in the wet scrubber needs fully as much attention as any other part of the plant in the weekly cleaning. Any closing of the perforations should immediately attract attention. The danger of these being stopped up is greater where a low grade bituminous coal is used than when anthracite is burnt exclusively. This fact should make an operator more careful and watchful for trouble.

The water used for cooling purposes in the gas plant is a question not always carefully studied, especially in regions where the supply shows unusual impurities. Dirty, muddy and water highly charged with chemical impurities must have its injurious effect upon a gas plant. In the scrubber and vaporizer impure water will often play the mischief. It has proven in many cases so bad that the plant has been injured beyond repair through the deposits of scale and other impurities on the inside metals. Yet in order to save a high water tax many operators will use some dirty river or pond water. Many impurities of water are soluble at high temperatures and do no harm, but other chemical compounds are not soluble and as a result they deposit impurities upon the scrubber and all through the inside of the plant.

Water Circulation.

A system of re-circulation should be devised where city water is used to avoid using impure water from some river or pond. If this re-circulation system is properly devised, there ned be but little expense in using the city water. A method of such re-circulation was devised by a company in New Jersey which involved the building of a supply tank on the premises with a capacity of 60,000 gallons. This tank is elevated some 30 feet above the engine, and under the producer room floor there is built a catch basin tank holding 1,200 gallons. The cooling water flows from the main supply tank to a smaller one, and is then fed to the cooling jacket by gravity. After performing its function there it goes to the catch basin tank below. From here it is pumped up at intervals to the main storage tank, passing first through a strainer, and also through another series of strainers from the supply tank before entering the cooling jacket the second time. A small pump bolted to the main line shaft transfers all this water back to the main tank, and the operator has only to see that the catch basin does not overflow. By this method of re-circulation the cost of water from the city is a very small item, and its purity and freedom from chemical compounds makes it advisable to go to this expense of installation.

COMPARISON OF LOCOMOTIVE BUILDING METHODS IN THE UNITED STATES, GERMANY AND FRANCE.*

By Marcel Bloch.[1]

During the last few years French railways have purchased in Germany and in the United States a certain number of locomotives at more satisfactory prices and deliveries than those offered by French builders.

It is the purpose of this article to investigate the various causes that justify this difference in price and delivery by comparison of locomotive building methods and conditions in the United States, Germany and France. We will consider the questions of earlier delivery and lower factors separately, although it is clear that both are inseparable factors. A company crowded with work will naturally demand higher prices than one lacking orders, and, of course, the delivery will be earlier for the latter than for the former.

The requirements of each country have been responsible for the erection of shops whose size is proportionate to the local demand. Considering only standard gage locomotives, it would appear that the United States, with two large companies and a few of minor importance, has an average yearly capacity of over 5,000 locomotives; the 14 German locomotive works can deliver each year 2,000, while in France, with six builders, only 400 engines are built yearly.

Consequently, although, in the United States and Germany it is possible for the locomotive industry to be specialized, this is not the case in France, where all builders of locomotives find it necessary to engage in other work at the same time. For example, the Societe Alsacienne builds stationary engines, electric motors, turbines and looms; the Fives-Lille Co. builds turbines, sugar refining machinery, bridges; the French Mechanical Construction Co. builds bridges, freight and passenger cars, shop machinery, etc., without mentioning the Creusot Company, the Batignolle Works and the French-Belgian Co., which are all in the same condition. The locomotive is a somewhat difficult machine to build, for prices are very closely discussed in France and inspection is very severe, and these requirements naturally cause French builders to devote themselves preferably to other mechanical work. This peculiar situation appears to influence both price and delivery to a very great extent.

Having thus briefly exposed the purpose of this article, the writer will now consider in detail the methods pursued in the three countries, with illustrations taken from actual observation in different shops. The comparison being based only upon the construction of a locomotive of the French type, the writer need not take into account the great advantage possessed by American and German builders when building locomotives of their own standard type, frequently duplicated.

Early Delivery.

Every locomotive building plant consists of the same number of departments—namely, main offices, drawing room, power house, pattern shop, foundry, blacksmiths' shop, boiler shop, machine shop and erecting shop.

These departments will be considered successively in the above order, without going into details familiar to most readers, and the writer will note only the characteristic differences of execution obtaining in the different countries:

Main Office.—Americans, being men of action, always wish to accomplish things rapidly; they think and act rapidly and always seek the shortest way of reaching the desired result. It is always more important in the mind of an American to obtain results rapidly, even if in some cases better results could be obtained by slower methods. This accounts for the rapidity of execution in all American offices, so surprising to a European. As an example, take the handling of incoming mail at the Schenectady Works of the American Locomotive co. The letters arrive at 7:30 a. m., brought by one of the company's messengers from the post office. They are immediately opened in the main room and distributed by boys 13 to 15 years old to the various departments, where such replies as can be decided immediately are dictated at once to stenographers. When a reply requires careful deliberation the clerks at once obtain the desired information, and as soon as received dictate the letters and send them up ready for signature. All the higher employes are authorized to sign for the manager, and write the latter's name with their initials after it. Outgoing mail is then carried to the mail room and posted. Extensive use is made in America of the telegraph and telephone, which are much more readily accessible than in Europe on account of the greater number of lines and competing companies. Americans appear to use them, regardless of cost, which is much higher than in France. All large plants have their own telegraph operator, and generally lease a special wire, connecting them with New York or Chicago, according to their location. With such an organization it is easy to understand how rapidly replies can be received, particularly when the use of the signature is distributed among so many different employes. Replies are often made over the telephone or telegraph. Papers, letters, etc., are carried from and to the various departments by messenger boys, 13 to 15 years old, one of whom is assigned to every foreman's office.

Both in France and Germany the office system is much more complicated. Confidence in the ability of subordinates is much more limited and individual responsibility is less general than in America. In the latter country each man is responsible for his own actions, while in Germany and France the chief of the department bears the full burden; this method necessitates a large amount of checking, inspecting, corrections, etc., which, while they have their advantages, naturally greatly lengthen the time required.

From the point of view of rapid production the American system certainly presents very great advantages.

Drafting Department.

American drawing rooms are organized in a very remarkable manner, and always greatly impress the European who has occasion to visit them. The work is gotten out in the following order, when, as generally practised in America, the builders furnish their own working drawings and design their locomotives themselves:

The chief draftsman gives the principal data of the engine to be designed to one of his leading draftsmen, and the latter, with one or more assistants, establishes the design and passes it on to one of the detail draftsmen, each one of which completes the design of that part which is his specialty. Detail draftsmen are divided in departments, as follows:

1. Boiler, ash pan, firebox.
2. Frames and crossties.
3. Cylinders, steam pipes.
4. Rods, pistons.
5. Motion work.
6. Suspension, wheels.
7. Tenders.
8. Runboards, cabs, pilots, etc.

For the delivery of these drawings to the different shops each one of the above departments follows a rigorously established order issued by the superintendent of the drawing room. This order, in tabulated form, gives the maximum number of days which

*Translated from the *Revue Generale des Chemins de Fer*, by the *Railroad Age Gazette*.

[1]Motive power inspector of the Paris-Orleans railway.

must elapse between the delivery of drawings to the shop and the complete termination of the first engine of lot. The delivery of these drawings is therefore based upon the delivery of the first engine. Each draftsman makes his own tracings, which saves him from completely finishing his pencil drawings; being in possession of all details it is easy for him to finish his tracing even from a mere rough sketch. In this way the position of tracer is suppressed, with corresponding saving of time and force. Lastly, a very complete system of classification by numbers of all drawings permits the draftsmen to refer with great facility to previous similar drawings for guidance. A great number of fittings such as cocks, small shafts, etc., does not vary from one type to another, and for such there exists a collection of "standard drawings" which greatly facilitate the work.

In Germany and France, two or three draftsmen get up the design of a locomotive complete. Their drawings are not transmitted to the tracers until they are complete in every detail. The only difference existing between French and German drafting methods is the more extensive use in Germany of the standard drawings. This is accounted for by the fact that the German locomotive is much simpler than the French and that German builders, being allowed a much greater latitude in the matter of details, generally base new designs upon those of locomotives built, thus enabling an entire design to be gotten up in much less time.

Material Orders.

It is clear that the greater a country's production of raw material, the easier it is for builders to obtain their supplies. In this matter there is an enormous difference between the United States, having an annual production of 25,000,000 tons of cast iron, Germany with 10,000,000 tons per year, and France with only 3,000,000. It is clear that French builders, all other conditions being equal, are greatly handicapped by long delays in the delivery of raw materials.

(To be continued.)

TRADE PUBLICATIONS.

ALTERNATING CURRENT GENERATORS—The Crocker-Wheeler Co., Ampere, N. J., in Bulletin No. 114 describe their coupled types of alternating current generators, as employed in connection with turbines, water wheels, gas, oil and steam engines. The company also announces that the illustrated two-volume catalog of the Wheeler gift of books, etc., to the American Institute of Electrical Engineers, edited by William D. Weaver, which is the most complete list of electrical books ever prepared, is completed and is being distributed to the members and associate members of the Institute.

GASOLINE LOCOMOTIVES—Pamphlet No. 100, 28 6 x 9-inch pages, issued by the Milwaukee Locomotive Manufacturing Co. describes a line of locomotives for various industrial purposes, as well as for passenger service on suburban roads. The pamphlet is illustrated with numerous instances of application and of the different designs and sizes built, with details of construction.

PIPE FITTINGS.—The Pittsburg Valve & Fittings Co., Barberton, O., have issued a 244-page, 5 x 7½-inch catalog of the line of valves, cocks and miscellaneous fittings manufactured and sold by them. The line appears to be very complete and covers both iron and brass goods in the various weights used in standard practice.

CASTERS—Catalog No. 75, 48 6½ x 10-inch pages, issued by the Universal Caster & Foundry Co., 1170 Broadway, New York, describes a very full line of sizes and styles of casters for various uses, such as furniture, pianos, trucks, etc.

FINISHED BOLTS, SCREWS, ETC.—A very neat little 16-page booklet by the Electric Welding Products Co., Cleveland, O., describes a line of finished bolts and screws produced by the electric welding process in which the heads and bodies are electrically welded. Another booklet illustrates a variety of work produced by the same process, such as poppet valves, drive and cam shafts, connecting rods, levers, worm shafts, etc.

GASOLINE LOCOMOTIVES—Bulletin No. 150 by Ernst Wiener Co., 50 Church street, New York, describes gasoline locomotives and side and bottom dump cars and platform cars built for industrial purposes.

MINE CAR COUPLINGS—The Watt Mining Car Wheel Co., Barnesville, O., have issued their catalog "E" covering a variety of couplings for mine cars, both of the chain and automatic type.

IRON AGE DIRECTORY—The 13th annual edition of this directory, issued by the David Williams Co., New York, is being distributed. It consists of 376 4¼ x 6½-inch pages and is a classified index of the goods manufactured by the regular advertisers in *The Iron Age*.

TURBINE WATER WHEELS—The Trump Mfg. Co., Springfield, O., have issued an 84-page, 6 x 9-inch catalog of their water wheels and transmission machinery. The catalog is illustrated with numerous photos of water power plants in various parts of the world.

ELECTRIC APPARATUS—The General Electric Co. have recently issued several new bulletins. No. 4661 contains a description and numerous illustrations of aluminum lightning arresters for alternating current circuits. Dimensions and diagrams of connections for circuits of from 4,600 to 110,000 volts are also shown.

No. 4662 covers Thomson recording wattmeters for switchboard service. This bulletin illustrates and describes the various types of wattmeters and their parts, and in addition gives dimensions and connection drawings.

No. 4663 covers lightning arresters for both alternating and direct current circuits. The lightning arresters described in this publication were designed after consideration of the great variety of conditions and phenomena produced by lightning, including effects of abnormal voltage.

No. 4664 is devoted to a new line of direct-connected engine-driven railway generators, Form S, which embodies a number of improvements over previous typs. The standard line of these generators range in capacity from 100 kw. to 2,700 kw., and the speeds have been selected to adapt the generators for direct connection to steam engines. They are designed to run at constant speed, and for the prevailing full load railway voltages.

No. 4668 covers the GE 216-A railway motor, which represents the latest construction in this class of apparatus. It is of the box frame type, equipped with commutating poles and mica insulated brush holders, and the armature shaft is removable.

No. 4669 illustrates and describes the various types of Curtis steam turbines for low pressure and mixed pressure. In addition to the illustrations of the turbines, this bulletin contains curves showing tests of an engine in combination with a low pressure Curtis turbine and a chart showing the power output and costs, which indicate the increased capacity and economy secured by installing low pressure turbine sets.

No. 4670 covers gaskets and bell mouths for conduit wiring, marine railway car equipments and underground circuits. The illustrations in the bulletin consist of dimension diagrams of the soft rubber gaskets and metallic bell mouths, and a complete set of tables enables the customer to determine the size of bell mouths required for any particular service, and to readily ascertain the proper gasket which should be used with it.

MILLING MACHINERY—The C. O. Bartlett & Snow Co., Cleveland, O., have issued their catalog No. 30, 128 6 x 9-inch pages describing a line of hoists, conveyors, crushers, driers, fuel lighters, paint machinery, etc. The catalog also illustrates a line of grain milling machinery, gears, link belts, sprocket wheels, chains, etc., and numerous illustrations of existing installations of conveyors handling coal, stone, ore, grain, and miscellaneous materials.

RUST PROOFING—The Globe Machine & Stamping Co., Cleveland, O., have issued a very neat little pamphlet describing "Sherardizing," a modern rust-proofing process and its applications and the apparatus employed therefore.

MINE FANS—Bulletin No. 23 by the Jeffrey Mfg. Co., Columbus, O., describes briefly the propeller fan for mine ventilation made by this company.

REPORT ON BLACKWELL'S ISLAND BRIDGE—The Pennsylvania Steel Co. have issued a copious report on the Blackwell's Island Bridge, commonly known as Queensboro bridge, written by F. C. Kunz, chief engineer of the Pennsylvania Steel Co., and a commission consisting of Charles Macdonald, C. E., past president American Society Civil Engineers; C. C. Schneider, C. E., past president American Society C. E.; H. R. Leonard, C. E., and J. E. Greiner, C. E. This report is the result of the various criticisms of the bridge following the failure of the Quebec bridge, and is illustrated by numerous strain diagrams and tables.

FURNACE SLAG.—The Cleveland Macadam Co. have issued a 16-page pamphlet illustrating the use of furnace slag in various forms of structural work including paving, roofing, flooring, sewering and building construction.

STEAM AND WATER SPECIALTIES—Warren Webster & Co., Camden, N. J., in part eight of general catalog, 80 6 x 9-inch pages, describe a line of steam and water specialties manufactured by them, including heaters and purifiers, traps, radiation systems, separators, etc.

FUEL FEEDERS—The Vulcan Furnace Co., Buffalo, N. Y., have issued a catalog describing their apparatus for the feeding of low grade fuel, in which the fuel is automatically crushed and fed to the furnace at a uniform rate which can be varied as desired.

UNDUE ATTENTION PAID TO SMALL FLAWS IN STEEL.

(Continued from page 74.)

Referring to the tests on the Havre de Grace bridge, one of the members stated that the paint on the bridge proper is in better condition than that on the panels. This statement was questioned by another speaker, who said that this might be true when comparisons are made with certain protected portions of the bridge, but believed that in general the panels are by far in the best condition. The rate of application of the paint would also have a considerable bearing upon its wearing qualities and it is altogether probable that the paint has been applied at a much lower rate on certain parts of the bridge than on the panels. The rate of application on the panels varied from 300 to 1,000 square feet per gallon of paint.

The wisdom of the tests as conducted by the joint committee was unfavorably commented upon by another speaker, but Dr. C. B. Dudley believed that its members deserve great credit for the work they have undertaken. One paint manufacturer said that he was never able to secure as good results from laboratory investigations as to the wearing qualities of paints as from service tests.

The opinion was also expressed that pigments which are found to be accelerators of corrosion when used with some vehicles for spreading or mixed with some other pigments might be changed to inhibitors. To illustrate this point experiments undertaken two and one-half years ago were cited. Two pigments, both accelerators of corrosion, were used with their proper vehicle, in this case linseed oil, and were applied to steel plates. None of these have shown any indication of corrosion and the film recently stripped from one plate, while retaining its original luster, exposed an almost perfect surface on the plate, which showed absolutely no signs of corrosion.

Papers describing the principal features of a testing machine of 1,200,000 pounds capacity, with special reference to a new system of transmitting the pressure developed in the hydraulic cylinder to the brake beam, and a machine of new design for hardness test, were presented by Thorsten Y. Olsen, Philadelphia.

SATURDAY MORNING.

Standard Specifications for Buying Foundry Pig Iron, as presented by Walter Wood, chairman of Committee B, were referred, without revision, to the members of the society for letter ballot at the closing session, Saturday morning. These specifications, favorably acted upon by the American Foundrymen's Association at the annual convention of this organization held in Cincinnati in May, include clauses for the purpose of adjusting disputes between buyer and seller, as published in THE IRON TRADE REVIEW, May 27. The prompt submission of these specifications for a letter ballot was urged by the committee so that they can be presented at the International Congress for Testing Materials to be held in Copenhagen, Sept. 7-11. A change in the specifications for locomotive cylinders was also recommended inasmuch as the silicon content, as now provided, is believed to be too high, and its reduction to 1.25 per cent was urged. This will be considered by the sub-committee on cylinders during the year and will be reported upon at the next meeting.

Standard Methods of Testing.

The report of Committee K on Standard Methods of Testing was presented by Gaetano Lanza, chairman. It recommended the adoption of uniform methods for making tensile, compression and metallographic tests to promote accuracy of practice in the various laboratories throughout the country engaged not only in research work but other lines of investigation as well. It was suggested, however, that these not be considered obligatory by laboratories pursuing methods that insure accuracy of results. The report was not submitted as a final draft by the committee and the chairman requested recommendations for changes by the members of the society so that it could be presented for approval next year.

The work done by the structural material testing laboratories, United States Geological Survey, during the year ending June 30, 1909, was briefly summed up by R. L. Humphrey. A large part of the equipment of the St. Louis laboratory has been removed to Pittsburg and is being erected on the Pittsburg arsenal grounds. No less than 10,000 tests have been made in the last 12 months and the investigations under way include a study of concrete beams; the effect of time on concrete; the effect of alkali on cement; brick for building purposes and a classification of clays; load carrying capacities of fire brick and clay products when subjected to high temperatures, and it has already been found that their load carrying properties fall off rapidly as the temperature is increased. A preliminary study of plain concrete columns was completed during the year and tests of the constituents of concrete were concluded. Tests of the corrosion of wire are under way and a comprehensive study of the stone of the United States is being made. At the Atlantic City laboratory the affect of salt water on cement is being investigated, while at Northampton all of the material used in the building of the Isthmian canal is being tested. The urgent need of tests of refractory brick and clay was pointed out and Mr. Humphrey stated that this work is now under way in Pittsburg.

A resolution appointing Dr. C. B. Dudley, president, the official representative of the society at the International Congress for Testing Materials to be held in Copenhagen in September was unanimously adopted.

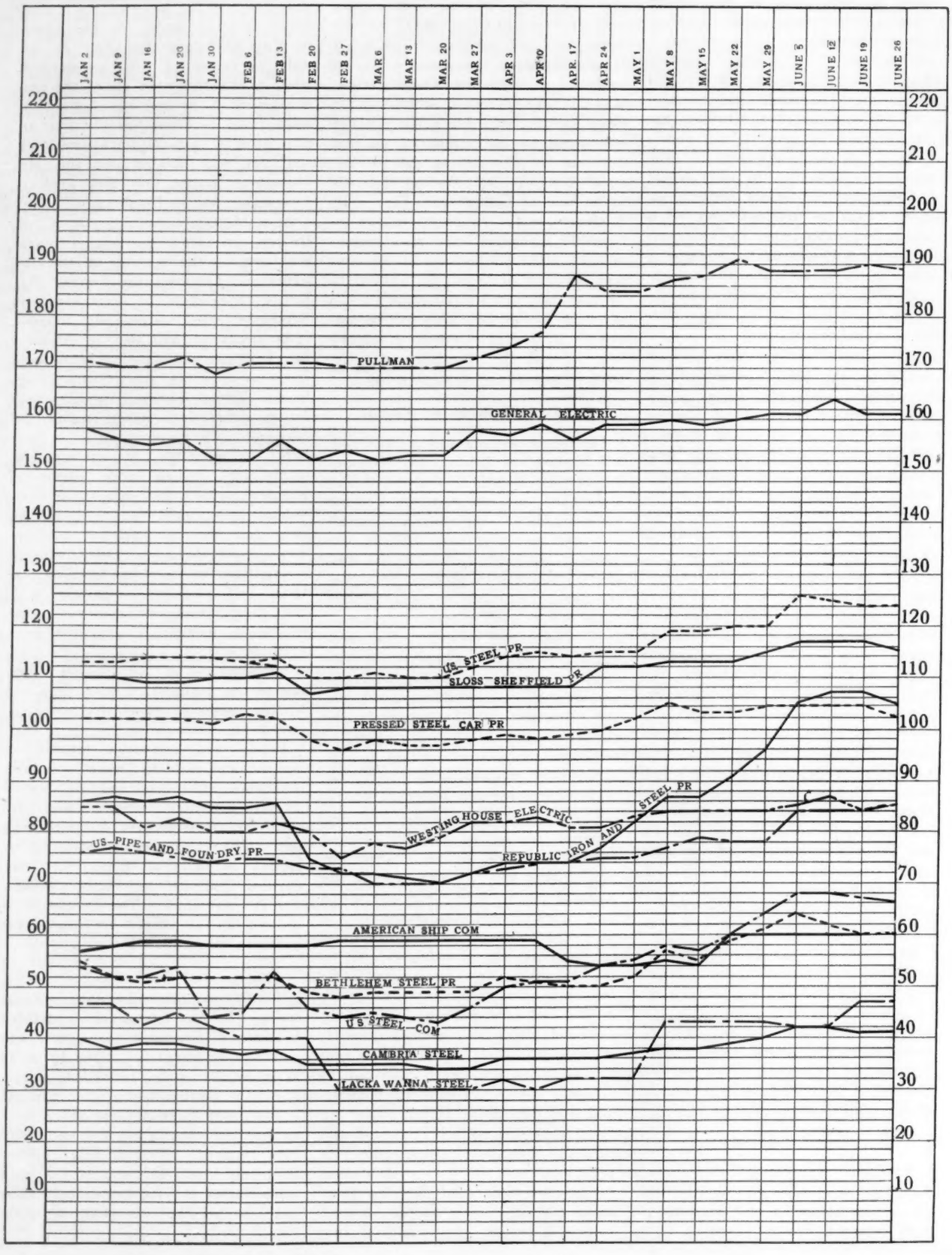
An invitation will also be extended the International Association to hold its next congress, three years hence, in the United States. Another resolution, referred to letter ballot, recommends the construction of a machine or machines, of sufficient capacity for testing large structural members, and the support of the federal government is urged, to the end, that such a machine may become available also, under suitable restrictions, for research tests of material and structural members with the co-operation of engineers not necessarily connected with the government service.

Amendments of the by-laws relating to the payment of dues, proposed by the executive committee were referred for letter ballot.

Papers and committee reports on cement and concrete were presented Thursday afternoon, and the entire Friday afternoon session was devoted to discussions of bitumens and oils. The entertainment features included an informal dinner Thursday evening and an engineering smoker, Friday evening. The registration showed an attendance of nearly 300 members.

The Massachusetts Institute of Technology, Boston, has definitely decided to start a movement for a new site and new buildings. A tract 30 or 40 acres is absolutely demanded, and is desired in the limits of Boston city. It is estimated $5,000,000 will be required to give the institute the site and buildings required. Need of new quarters is already keenly felt, and even if work were started at once it would take five years to get the new plant in operation.

Industrial Stock Movements in Past Half Year



Stocks Reflect Midsummer Dullness

On the opposite page is printed a chart showing in outline the fluctuations in the prices of some of the leading industrial stocks, ranging from those of companies manufacturing cars and railroad equipment to cast iron pipe. The chart takes into account the range of prices from week to week, beginning with Jan. 2 and ending June 26, thus including the half year just closed.

It will be noted that the prices with which the chart begins are fairly high, as compared with the prices of these stocks during the entire year preceding, 1908. With the lull of business first apparent in the middle of January, some of the stocks slumped, partially recovered and again fell markedly following the mid-February announcement of reductions in the prices of steel material generally. Renewed activity in the general steel and iron market, the first sign of a return of better times, was noted in the week of March 20-27 in the gradual rise in the prices of stocks, which thenceforward moved steadily upward until the week of June 12-19. In the latter part of June, most of the leading industrial stocks declined from a fraction to several points, possibly reflecting the mid-summer dullness which is always apparent in manufacturing circles as July 1 approaches.

The stock exchanges of the country were closed Saturday of last week and Monday of this. Price changes last Monday were few but averaged higher. A strong rally developed Tuesday; wheat closed higher. Dullness together with reactionary tendencies characterized Wednesday's market; railroad reports for May showed large increases in both gross and net. Thursday's market was firm but dull. The market was dull Friday, but the average was higher.

Gold to the amount of $2,750,000 was engaged for export. New York banks reported increase in surplus reserve of $1,549,525. Call money averaged 1¾ per cent and time money was also easy. Bank clearings for the week increased 10 per cent over the previous week and 42 per cent over the corresponding week last year. Idle freight cars decreased 14,615 on report made July 1. Actual figures of clearing house banks showed surplus decreased $11,005,850; loans increased $26,047,100; deposits increased $22,038,600; and the ratio of reserve, 27.0, a decrease of 0.7 per cent. Non-member banks and trust companies showed loans increased $24,728,100; net deposits increased $27,417,600; and the ratio of reserve was 18.9, a decrease of 0.2. Commercial failures for the week were 250, as against 217 the preceding week, and 277 the corresponding week last year. Shares were sold to the number of 2,224,291 compared with 3,645,865 the preceding week and 851,600 the corresponding week last year. Bonds exclusive of government bonds were sold to the amount of $21,688,000, compared with $23,520,000 the preceding week and $9,548,000 the corresponding week last year.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. July 2	Changes in Week	Date 1909 Ann.	M't'g.	Stock Outstanding	Basis	Dividend Last Declared	Dividend Date Last Div. Pay.
Allis-Chalmers	15⅛	.....	Sept.	2	$19,820,000		.....	.....
Allis-Chalmers, pr	51¾	+ ⅛			16,150,000	7 cum	1¾ Q.	Feb., 1904
American Can	11½	+ ⅛	Feb.	2	41,233,300		.....	.....
American Can, pr	82¼	+2			41,233,300	7 cum	1¾ Q.	July, 1909
Am. Car & Foundry	57½	+1¼	June	24	30,000,000		½ Q.	July, 1909
Am. Car.& Fdy., pr	117¼	+ ¼			30,000,000	7 n. c.	1¾ Q.	July, 1909
American Loc	60⅜	+ ½	Oct.	19	25,000,000	5	1¾ Q.	Aug., 1908
American Loc., pr	118¼	+ ½			25,000,000	7 cum	1¾ Q.	April, 1909
American Ship	59¾	— ¼	Oct.	13	7,600,000	4	1 Q.	June, 1908
American Ship, pr	109	.....			7,900,000	7 n. c.	1¾ Q.	Oct., 1908
Am. Steel Foundries(new)	49⅛	+ ⅜	Dec.	2	17,184,000		.....	.....
Am. Steel Foundries, pr	47½	.....			17,240,000	6 cum	1	Aug., 1904
Barney & Smith	30	.....	June	1	2,000,000	4	1 Q.	Sept., 1907
Barney & Smith, pr	91	.....			2,500,000	8 cum	2 Q.	June, 1908
Bethlehem Steel	30¾	+1¼	April	6	14,862,000		.....	.....
Bethlehem Steel, pr	61	+1			14,908,000	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	41¼	+ ¼	March	16	45,000,000*	3	1½ S. A.	Feb., 1909
Cambria Iron	46¼	.....			8,468,000*	4	2 S. A.	Sept., 1908
Chicago Pneumatic Tool	24¾	+1¾	Feb.	15	6,145,800	4	1 Q.	Oct., 1907
Colorado Fuel	44½	+1½	Oct.	18	34,235,500		3½	April, 1902
Crucible Steel	9	+ ¼	Oct.	20	24,578,400		.....	.....
Crucible Steel, pr	72	+2			24,436,500	7 cum	1 Q.	Mar., 1909
Empire Steel	10	+1½	April	27	1,254,770		.....	.....
Empire Steel, pr	60	.....			2,500,000	6 cum	3 S. A.	July, 1909
Fay & Egan	90	.....	Feb.	18	1,000,000	7	1¾ Q.	Nov., 1908
Fay & Egan,pr	125	.....			1,000,000	7 cum	1½ Q.	May, 1909
General Electric	164¼	+2¾	May	11	65,178,800	8	2 Q.	July, 1909
Harbison-Walker	20½	+ ½	Jan.	18	18,000,000		½	Oct., 1907
Harbison-Walker, pr	85	— ⅜			9,600,000	6 cum	1½ Q.	April, 1909
International Pump	39¾	+ ¼	June	8	17,762,500		1	April, 1905
International Pump, pr	88¾	+1¼			11,350,000	6 cum	1½ Q.	May, 1909
Lackawanna Steel	47	.....	March	10	34,971,400		.....	.....
Lake Sup. Corp	23½	.....	Oct.	6	40,000,000		.....	.....
New York Air Brake	87½	+ ½	June	17	8,012,500	8	2 Q.	Oct., 1907
Niles-Bement-Pond	100	.....	Feb.	3	8,500,000	3	1½ Q.	June, 1909
Niles-Bement-Pond, pr	100	.....			2,000,000	6 cum	1½ Q.	May, 1909
Otis Elevator Co	57	.....	March	15	6,375,300		1½ S. A.	April, 1909
Otis Elevator Co., pr	98	.....			6,295,000	3 n. c.	1½ Q.	July, 1909
Penn Steel	50	.....	May	10	10,750,000		.....	.....
Penn. Steel, pr	111	+2			16,500,000	7 n. c.	3½ S. A.	May, 1909
Pittsburg Coal Co	11	.....	March	9	28,104,600		.....	Nov., 1906
Pittsburg Coal Co., pr	50	.....			27,071,800	7 c.	1¾	April, 1905
Pressed Steel Car	43⅞	+1⅛	Feb.	17	12,500,000		3	Aug., 1904
Pressed Steel Car, pr	104¼	+2			12,500,000	7 n. c.	1¾ Q.	May, 1909
Pullman	188	—1	Nov.	10	100,000,000	8	2 Q.	May, 1909
Railway Stl. Spring	44⅜	+1⅜	March	4	13,500,000	2	1 S. A.	Oct., 1908
Railway Stl. Spring, pr	105	.....			13,500,000	7 cum	1¾ Q.	July, 1909
Rep. Iron & Steel	31⅜	+ ⅜	Oct.	20	27,191,000		.....	.....
Rep. Iron & Steel, pr	104¼	.....			20,416,900	7 cum	1¾ Q.	July, 1909
Sloss-Sheffield	83¾	+1¾	March	10	10,000,000	5	1¾ Q.	June, 1909
Sloss-Sheffield, pr	115¾	+ ⅜			6,700,000	7 n. c.	1¾ Q.	July, 1909
U. S. Pipe & Fdy	33¼	.....	June	23	12,500,000	2	½ Q.	Dec., 1907
U. S. Pipe & Fdy, pr	85	.....			12,500,000	7 n. c.	1¾ Q.	Sept., 1908
U. S. Steel	69¼	+2¾	April	19	508,302,500	2 n. c.	½ Q.	June, 1909
U. S. Steel, pr	126⅛	+2⅛			360,281,100	7 cum	1¾ Q.	June, 1909
U. S. Steel, 5s	105⅞	+ ⅜			463,798,000	5	5 A.	.....
Va. Iron, Coal & Coke	63	+1	Sept.	21	9,073,680		.....	.....
Westinghouse Elec	85½	+ ½	June	16	27,173,200	10	2½ Q.	April, 1909
Westinghouse Air Brake	110	.....	Oct.	5	14,000,000*		2½ Q.	Oct., 1907

Par value of shares, $100, except those starred (*), $50.

Copper Stocks.

New York.—Amalgamated Copper closed 82¾, a net gain of 1¼.

Boston.—Butte Coalition closed 25½, a net gain of ¼; Calumet & Arizona closed 104, no change; Calumet & Hecla closed 650, a net loss of 8; North Butte Mining closed 56¼, a net loss of 1; Quincy Mining closed 90, a net gain of 1.

Financial Notes.

The American Iron & Steel Mfg. Co. will pay July 1 the balance of ⅜ of 2 per cent on dividends declared on both common and preferred stocks March 12, 1907, this being the dividend held back by pending litigation now closed; the Columbus Chain Co., Columbus, O., declared the regular quarterly dividend of 1½ per cent on preferred and on the common stocks, both payable July 1; the Vulcan Detinning Co., the regular quarterly dividend of 1¼ per cent on the preferred, payable July 20.

NEWS FROM MANY INDUSTRIES

New Buyers:—

The Milwaukee Boat & Tank Co., Milwaukee, Wis., capitalized at $10,000, has been incorporated by Bernard A. Weserski, Joseph F. Talsky and Daniel D. Durkin.

The A. B. C. Train Operating Co., Chicago, manufacturing machinery and supplies, with $25,000 capital stock, has been chartered by Heidman & Street, Monadnock building, Chicago.

A certificate of incorporation has been granted to Charles W. Kimball, Wallace P. Moats and James A. Platner, Kansas City, Mo., as the Kansas Machine Co., with $100,000 capital stock.

I. J. Boyce & Co., Chicago, has been incorporated to manufacture machinery and supplies, with $25,000 capital stock. Kendall & Luby, 84 LaSalle street, are the incorporators.

The American Laundry Machinery Co., Ltd., has been incorporated at Toronto, Can., with $40,000 capital stock. Those interested are Adam Kruter, Eugene F. Underhill, Daniel McC. Cooper and others.

The Ontario Pump Mfg. Co., Rochester, N. Y., manufacturing pumps, with $10,000 capital stock, has been incorporated by Thomas T. Graser, Roscoe R. Stitt, W. Stevens Hall, all of Rochester, N. Y.

The Thomas Buchanan Co., Cincinnati, machine shop supplies, has been incorporated with $30,000 capital stock by Thomas Buchanan Sr., Thomas Buchanan Jr., William Buchanan, Charles L. Buchanan and Carl G. Buchanan.

The Independent Steel Co. of America, of Kenova, W. Va., has been incorporated with $2,000,000 capital stock by Arthur Hirsh, of Pittsburg; H. T. Lovett, M. P. Wiswell, John S. Shepherd and E. M. Williams, of Huntington, W. Va.

The Gilbert Iron & Steel Co., New York City, iron and steel, with a capital of $50,000, has been incorporated by Joseph M. Gilbert, Hackensack, N. J.; Rudolph F. Heiles, East Orange, N. J., and Charles L. Gilbert, 272 New York avenue, Brooklyn, N. Y.

The Leslie Mfg. Co., Boston, has been granted a charter to manufacture and sell tools, with $500,000 capital. The president is Frank A. Burbeck, Malden; vice president, James W. Leslie, Chelsea; treasurer and clerk, Everett H. Hadley, 141 Milk street, Boston.

The C. R. Baird Co., Manhattan, manufacturing iron, steel, coke, copper, etc., with a capital of $25,000, has been chartered by Chester R. Baird, 37 Madison avenue, New York City; May C. Baird, 37 Madison avenue, New York City, and S. H. Baird, Philadelphia, Pa.

The Young & Talbot Co., Boston, to manufacture and sell machinery, with $50,000 capital stock, has been incorporated by Edward A. Young, president, 10 Lynde street, Boston; James N. Talbot, treasurer and clerk, 252 Clement street, Dorchester.

Rogers, Printz & Co., of Warren, Pa., filed articles of incorporation at Dover, Del., to manufacture and sell tools, with $50,000 capital stock. The incorporators are A. M. Printz, James P. Rogers, William R. Rogers.

A charter has been granted to the J. D. Thompson Co. to engage in the manufacture of sheet metal work. The incorporators are Walter D. Graham, of Brooklyn; Jefferson D. Thompson, of Thompkinsville, Staten Island; Lewis W. Harrington, of Short Hills, N. J.

A charter has been granted to the Zeitinger Co., New York, to engage in manufacturing machinery, tools, hardware, etc., with $25,000 capital stock. Those interested are Bernard I. Kamen and M. G. Bender, 34 Nassau street, and Charles Zeitinger, 161 Chrystie street, all of New York City.

J. W. Pohlman Foundry Co., Buffalo, for manufacturing stoves and operating an iron foundry, has been chartered with $10,000 capital stock. The incorporators are John W. Pohlman and Frederick Pohlman, 213 French street; and William F. Pohlman, 193 London street, all of Buffalo, N. Y.

The Electric Steel Co. of New York, New York City, has applied for a charter to manufacture and deal in iron, steel and ores, with $100,000 capital stock. Those interested are W. J. DuBois, 100 Broadway, New York City; James H. Wallace, Mariners Harbor, N. Y.; H. F. Kinney, 44 Court street, Brooklyn, N. Y.

The McElwee Sales Co., of Marlinton, W. Va., to manufacture parts of mowing machines and harvesters, with an authorized capital of $100,000, has been incorporated by B. F. McElwee, of Dunmore, W. Va.; N. W. Russell, of Lewisburg, W. Va.; R. S. Hickman, G. O. English, of Cass, W. Va., and G. W. Sharp, of Marlinton.

A certificate of incorporation has been granted to Bradford & Taylor Co., Brooklyn, manufacturing furnaces, ranges, steam and water heaters, etc., with $10,000 capital stock. The charter members are Robert E. McLear, 115 Broadway; George H. Seller and Arthur G. Quinn, also of 115 Broadway, New York City.

A certificate of incorporation has been granted to the Victor Flange Co., Buffalo, manufacturing flange and other plumbing and building supplies, with $10,000 capital stock. The incorporators are Joseph S. Candee, 594 South Park avenue; Frank T. Reynolds, 525 Prospect avenue; Cornelius Coghlan, 407 Parter avenue, all of Buffalo.

Blauvelt & West Co., 15 Pleasant avenue, Montclair, N. J., mechanical and electrical engineer, toolmaker, machinist, etc., has been incorporated with an authorized capital stock of $250,000. Those interested are William E. Blauvelt, 333 Bainbridge street; Robert W. Cole, 671 Butler street, both of Brooklyn, N. Y.; Edward West, 265 First avenue, New York City; and John Schneider, 15 Pleasant avenue, Montclair, N. J.

Articles of incorporation were filed with the county recorder by the Warm Springs Iron Works, organized at Salt Lake City, with a capital stock of $154,000. The company takes over in payment of the stock real estate, buildings and other property of the Warm Springs Foundry Co. The directors of the company include president, A. R. Lundin; vice president, D. McVichie; secretary, C. R. Swineford; treasurer, L. B. McCornick; F. W. Sherman and A. C. Ellis Jr.

Henry C. Quinby and John F. Valient, 165 Broadway, New York, and James F. Egan, 76 William street, New York City, have incorporated the Tesla International Propulsion Co., New York City, to manufacture pneumatic machinery, etc., with $1,000,000 capital stock.

The Threadless Lock-Nut & Bolt Co. of the United States, with an authorized capital of $500,000, has been granted a charter to manufacture bolts, spikes and nuts, etc. The incorporators are George H. Roberts, 20 Cambridge place; Robert Avery, 98 Second place; Walter Avery, also of 98 Second place, and others, all of Brooklyn.

The Arkwright Mill Co., Salt Lake City, has been incorporated with $100,000 capital stock by Samuel Sheldon, George A. Post, James Mitchell, Wil-

liam and Thomas Hand. The company plans erecting a plant for the manufacture of engines and other machinery.

The Harrisburg Iron & Steel Co., Harrisburg, Pa., has just been issued a Pennsylvania charter through directors William E. Friedman, B. F. Umberger and J. W. Swartz, the capital stock being placed at $25,000. The company is now operating a plant at Harrisburg.

Cyrus Currier & Sons, Inc., Newark, N. J., to manufacture cranes, presses, furnaces, forgings, castings, etc., have been incorporated with capital stock of $75,000, the incorporators being Harriet N. Currier, Francis S. and Cyrus Currier Jr.

New Construction:—

Confer, Smith & Co., Reading, Pa., are constructing an addition 65 x 70 feet to their foundry.

The Buffin Tool Co., Louisiana, Mo,. is planning to erect a two-story brick addition to its foundry.

Plans are being prepared by Architect Harry Randall for a manufacturing plant at Oklahoma City, Okla., for the Sherman Machinery & Iron Co., at a proposed cost of $250,000.

The United States Radiator Co. has let a contract for the construction of a large core room which will be built as an addition to its plant at Dunkirk, N. Y.

J. Eisner, president of the Eisner Machine & Mfg. Co., of St. Louis, has agreed with the board of trade of Ada, Okla., to build a machine shop and foundry in that city.

It is reported that the Griffen Wheel Co., Tacoma, is contemplating some improvements and extensions to its South Taacoma foundry.

The Rogers & Hubbard Co., Middletown, Conn., makers of scales, etc., will move the fertilizer branch of its plant to Portland, Conn.

Another concern to build an addition is the Spring Perch Co. of Bridgeport, makers of carriage and automobile springs. It will be a one-story, 52 x 65.

The Independent Steel Co. of America, recently chartered in West Virginia, has let a contract to Taylor & Robinson, of Huntington, W. Va., for the construction of a steel plant at Kenova.

Landers, Frary & Clark, New Britain, makers of hardware, are to erect a new power plant. The engine house will be 62 x 102 and the boiler house 70 x 76. Material will be brick with concrete floors.

The Empire Steel & Iron Co. has moved to its Macungie stack the stock hoist which was used a short while at the Emaus furnace and which was then replaced by other machinery.

The Lobdell Car Wheel Co., Wilmington, Del., has taken out a building permit for an addition to the company's plant, one story, brick and steel, 62 x 120 feet, to cost probably $7,500.

The Boston Machine Shops, Oroville, Cal., which were destroyed by fire about two years ago, are being rebuilt. Plans call for the construction of a building on practically the same foundation as the old.

The Rapid Motor Vehicle Co., which is planning a new works at Pontiac, Mich., has awarded the excavating contract. The plant will be 60 x 640 feet, two stories, of brick. Bids are now being received on the building.

The Michigan Stamping Co., Detroit, whose plant was recently damaged by fire, advises that its plans for rebuilding are made, and that at the present time it is not in the market for requirements along that line.

Some of the present structures at the car repairing plant of the Delaware, Lackawanna & Western railroad, located at East Buffalo, N. Y., are being torn down to make way for a new building in which it is proposed to construct new cars.

The McClintic-Marshall Construction Co., of Pittsburg, has been awarded the contract for 275 tons of structural steel to be used in rebuilding the frog and switch works at Carlisle, Pa., which plant was destroyed by fire some weeks ago.

The Temple Iron Works, Temple, Tex., proposes to enlarge its plant as well as add new machinery, because of the award to it by the Santa Fe Railway Co. of a contract to supply the railroad with all the castings to be used at the shops in the state of Texas for the coming year.

The Seaman-Sleeth Co., Pittsburg, has secured the contract for a full equipment of rolls for rolling all structural sections at the new plant of the Algoma Steel Co., Sault Ste. Marie, Ont. The mills for this equipment as has been previously announced, will be built by Mackintosh, Hemphill & Co., Pittsburg.

The Arandsee Machine Co., Ash and Second streets, Erie, Pa., advises that while it recently took out incorporation papers, yet it has been an operating firm for about a year. It is now erecting a two-story building, 60 x 70 feet, which will be equipped for the manufacture of its Simplex speed and pressure governors for air compressors, direct acting water pumps, pressure unloaders for compressors, combined throttle and regulating valves, reversing clutches, etc.

The Steel Fire-proofing Co., Wheeling, W. Va., advises that it is now erecting its first building which will be used for the manufacture of expanded steel lath. The company owns patents under which a diamond mesh lathe of exceptional stiffness is secured. The machines are all of special design and will be built in the company's own shops. It expects to begin operating by Aug. 1, in its new building, at which time it is the company's intention to develop other lines of steel fire-proofing construction.

The Morris Shearman Mfg. Co., Chattanooga, Tenn., boilers, structural steel, etc., is planning to proceed at once with the erection of a proposed plant, all buildings to be of steel, including the frame work, siding and roof. The main building will be 100 x 800 feet, and the office 25 x 50 feet. The entire plant will be operated by electricity, a power house being planned for. The new building will replace the present structure.

The Bolivar Foundry & Machine Co., Bolivar, Pa., advises respecting its recently noted incorporation that J. S. Miller, one of the incorporators, has been in the foundry and machine business in Bolivar since 1900. Since incorporated, the company is adding new buildings of brick and steel, making the plant practically fireproof. It will not be in the market for anything in the way of new equipment except for some minor matters, as it now possesses most of the equipment needed. The new foundry is nearly completed, and will be in operation within the next 30 days. The company proposes to do a general jobbing and repairing business.

Frost Gear & Machine Co., Jackson, Mich., advises respecting its recent purchase of the plant of the John Hutchinson Mfg. Co., that it has nearly completed extensive repairs including cement floors and new roof on three of the buildings, and has begun the installation of machinery. In addition to the equipment of its old shops, it is adding Jones & Lamson turret lathes, Libbey full swing lathe, several Cincinnati millers, a 36-inch Brown & Sharpe spur gear cutter, Besly disc grinder, a 3 x 50 Norton grinder, a Heald internal grinder, additional drill presses, multiple drills, hardening furnaces, etc. In the company's new quarters it will have available shop floor space of approximately 19,000 square feet, divided into two buildings 60 x 150 feet each, and an outlying drop hammer and hardening plant of about 1,200 square feet. The two

main factory buildings are joined by an office building 40 x 40 feet, two stories, the second floor of which will be used for an engineering department and the first floor for general offices. The company's entire business, so far as concerns automobile gearing and parts, is handled through the American Distributing Co., of Indianapolis. Beside manufacturing a larger line of automobile gearing, it does considerable business in gearing for other lines of trade.

General Industrial:—

The Austin Engine Co., Brooklyn, N. Y., has increased its capital stock from $25,000 to $50,000.

The Interlocking Steel Sheet Co., Chicago, has filed a certificate dissolving the corporation.

The Capital Foundry, Machine & Novelty Co., Frankfort, Ky., has increased its capital from $4,000 to $10,000.

The Simplex Motor Car Co., Mishawaka, Ind., has filed notice of increase in its capital stock from $200,000 to $400,000.

The Diamond Metal Stamping Co., Inc., Columbus, O., advises respecting its recent incorporation, that it is manufacturing specialties pertaining to window screens, metallic weather strips, etc.

Baldwin, Tuthill & Bolton, Grand Rapids, Mich., mill and foundry supplies and specialties, advise that it will be some months before an announcement can be made respecting the proposed addition to their plant.

The Oliver Machinery Co., Grand Rapids, Mich., wood working machinery, advises that it has increased its capital stock for the purpose of making additions to its line of manufacture, but it will not increase the size of its building at the present time.

A receivers' sale of the Waynesburg Forge, Sheet & Tin Mills, Waynesburg, Pa., which was scheduled for June 19, has been postponed until July 10. The receivers, John H. Strawn and Carl Bolby, thought that the highest bid which was received, $17,200, was too small and adjourned the sale.

The stockholders of the Union Mfg. Co., Chicago Junction, O., have filed a petition in court asking for the dissolution of the corporation. The company was originally organized for the purpose of manufacturing and repairing pumps, machinery and other supplies, but business has become unprofitable.

By a recent decision of the New Jersey court of errors and appeals, the American Can Co., is directed to turn over to the Vulcan Detinning Co. all profits made by the Vulcan company's secret detinning process. This is said to practically insure the payment of back dividends on the Vulcan company's cumulative preferred stock.

B. F. Avery & Sons, Inc., Louisville, Ky., agricultural implements, advises respecting the fire at its works recently, that damage was incurred by the material warehouse. It was not a large fire and in no way interfered with the progress of the business. The company has settled with the insurance companies, and is making its own repairs.

J. R. Hoe & Sons, Middlesboro, Ky., manufacturer of mine car wheels, light and medium weight castings, general repairing, etc., advises that it began business May 1 at Middlesboro, after removing to that city from Avonmore, Pa. It is doing a general line of business in iron, brass and jobbing work, and finds prospects for business very encouraging.

The James foundry at LaCrosse is putting on more men every week, especially in the casting department. Business is improving in this department, due to the extraordinary activity of railroads in the extension work in the west. The automobile department is operating full capacity.

The Wisconsin Steel & Iron Works has received an order for 1,000 tons of structural steel from the C. M. & St. Paul Railway Co. The Toledo-Massillon Bridge Co., of Toledo, has been given the order for 750 tons of structural material for use in Milwaukee, where track elevation is in progress.

The Elmira Heater & Foundry Co., Elmira, N. Y., has made application to change its name to the Elmira Foundry Co. The company formerly manufactured heaters in Williamsport, but removed to Elmira, and has discontinued this, now conducting entirely general foundry and machine business.

The Niagara Engineering Co., Manlius, N. Y., manufacturing marine and automobile gasoline engines, has been incorporated under the title of the Manlius Motor Co. The Manlius company is the outgrowth of the Niagara Specialty Works, which manufactured small electric motors, transformers and other specialties. This name was later changed to the Niagara Engineering Co., under which title the company built four-cycle gasoline engines. The first of the year it began designing a car in which to install the engine, and so far has been turning out a 30-horsepower 4-cylinder roadster and a 12-horsepower 2-cylinder runabout. It is now occupying floor space aggregating 5,280 square feet. While it now has a source of supply, yet it is in the market for steel forgings, pressed steel brass trimmings, steel tubing and other parts entering into the construction of engine and car. Interested in the company are M. J. and W. H. Topp, and C. A. Fowler.

Trade Notes:—

The general offices of the Ralston Steel Car Co., Columbus, O., have been removed from the fourth floor of the New First National Bank building to the fine new office building which has been erected at the shops in East Columbus. A downtown office will be maintained as a sales agency in the bank building. The plant of the company is operating nearer to capacity than in two years, many small orders having been booked in such quantity as to insure the operation of the shops through the summer.

J. K. Dimmick & Co., coke, coal and pig iron, with general offices in the Land Title Building, Philadelphia, announce that they have opened a branch sales office at 53 Pickering building, Cincinnati, with E. S. Kendrick as resident manager, to serve its many customers in that locality. The establishment of this branch office is in addition to that maintained at Uniontown, Pa.

The Pacific Coast Testing Laboratory, recently established at Seattle by J. H. Linton and A. W. Gregg for the purpose of specializing in foundry chemistry and metallurgical engineering has obtained permanent quarters at 210 Fern block.

C. W. Willette, of Seattle, Wash., an inventor and designer of saw-mill machinery, has been appointed western representative of the Phoenix Mfg. Co. of Eau Claire, Wis., which is manufacturing a number of his appliances.

Fires:—

The loss on the shops of the Pere Marquette railroad at Muskegon, Mich., June 20, will reach $180,000, as now estimated.

The warehouse of the Ontario Iron & Steel Co., Welland, Ont., was severely damaged June 25, the loss being placed at $3,000.

One of the departments of Hill & Griffith, Cincinnati, foundry supplies, was slightly damaged July 1, the loss being placed at $100.